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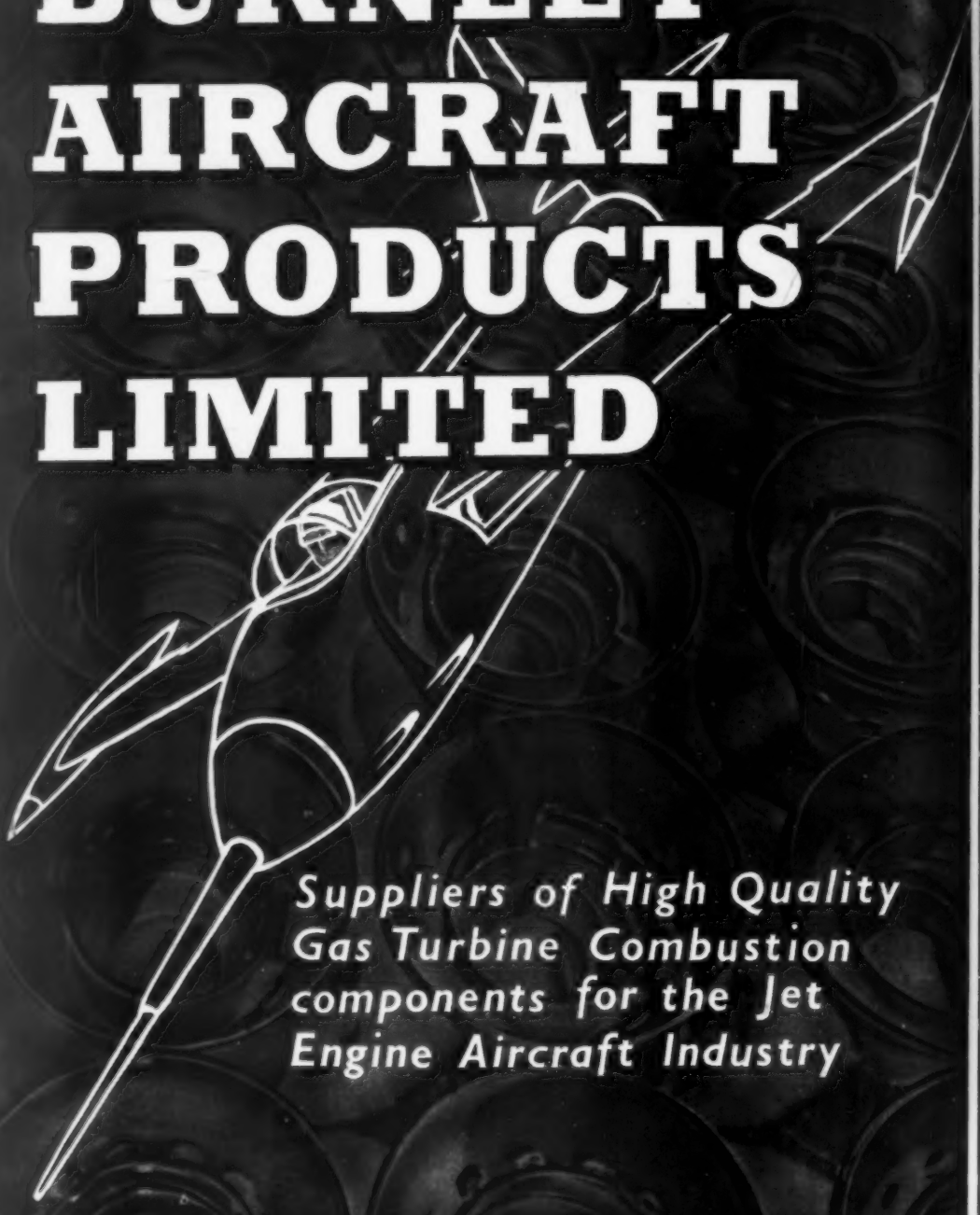

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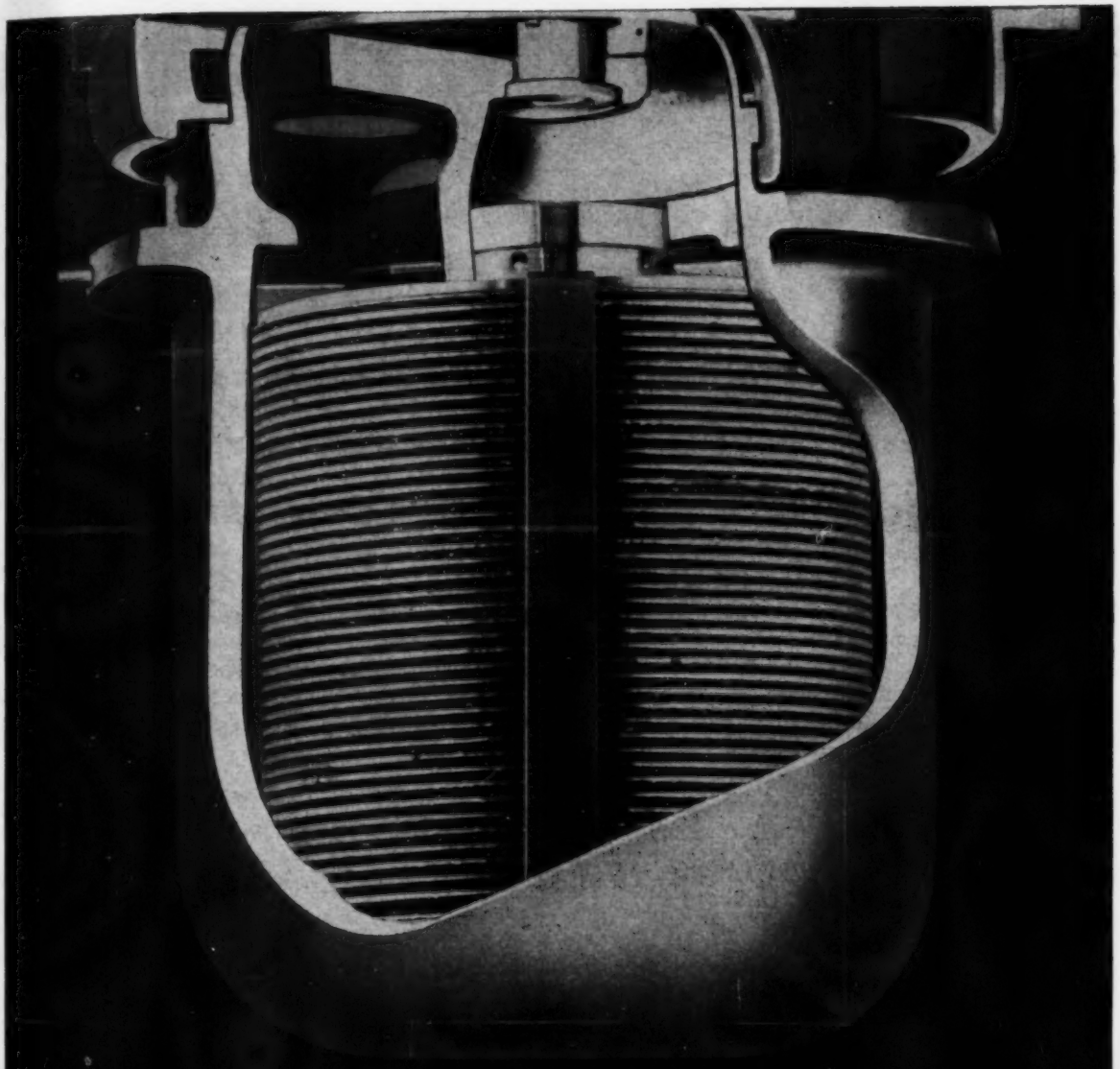

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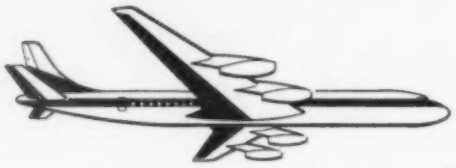

New Douglas pure jet cargo-passenger transport will cut direct air cargo costs to less than 4d per ton mile.

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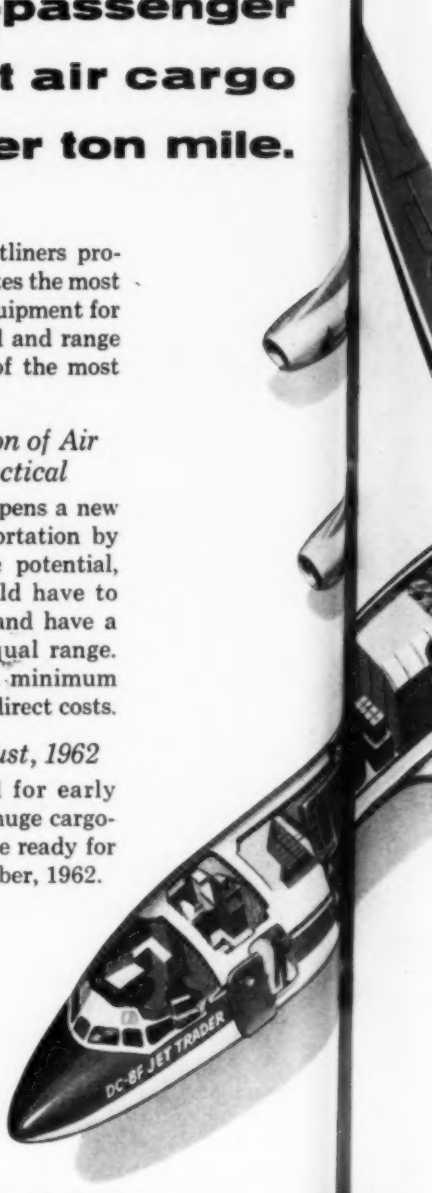
First flight is scheduled for early August of next year. The huge cargo-passenger transports will be ready for airline operation in November, 1962.



The Douglas Jet Trader will cruise at 575 mph, have a maximum range of more than 7,000 statute miles. Its four Pratt and Whitney JT 3D-3 fan engines provide 72,000 pounds of thrust. The freight section has an 86 x 140 inch forward door to accommodate the mechanized loading of nine large pallets. They will be moved through the cabin on rollers and guide rails and locked into place on floor tracks.

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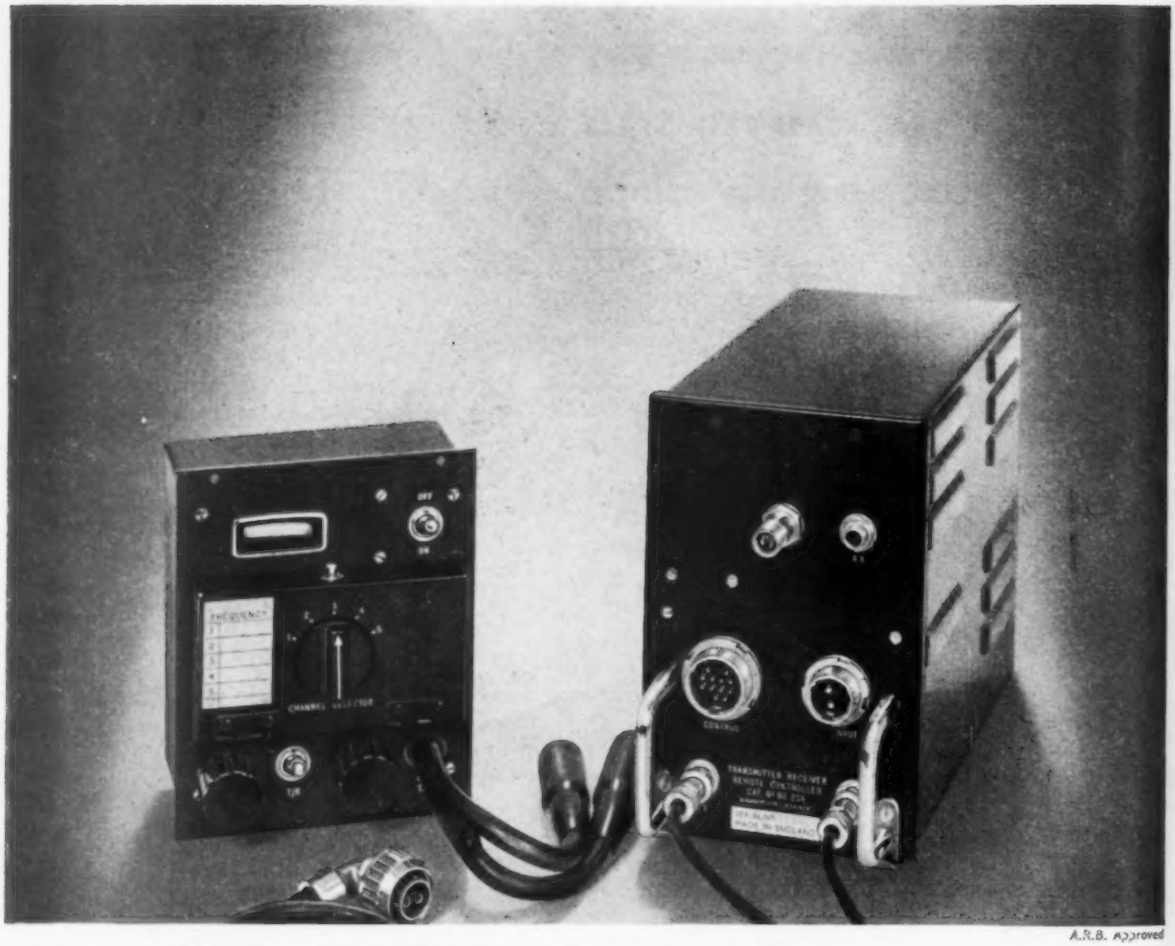

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The new BE.256 Light Aircraft Transmitter/Receiver—remote controlled version of the BE.255 with air to ground communication in the 116/132 Mc/s VHF band for a nominal range of 50 miles at 3,000 ft.

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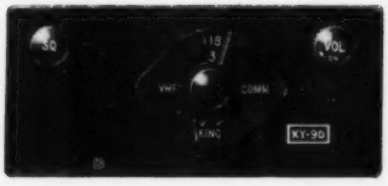
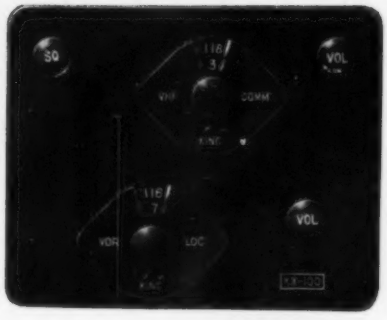


KY-90E TRANSCEIVER 91 CHANNELS, 100-kc spacing (117.9 - 126.9 + 117.9 mc) Crystal controlled, 10 watts transmit power with receiver sensitivity to match. Weighs less than 8 pounds—3.8 kg including power supply!

U.K. List price 14 volt - £370 28 volt - £410

KR-40 NAVIGATION RECEIVER. Complete omni and localizer coverage, 108.0 to 117.9 mc. Crystal controlled. One microvolt sensitivity. Built-in power supply and speaker audio amplifier. Weight total 3 pounds 1.4 kg.

U.K. List price 14 volt — £209 28 volt — £237



KX-100 COMM/NAV unit. All performance features of both KY90E Transreceiver and the KR40 NAV receiver in a single box. Separately tuned simultaneous COMMUNICATION and NAVIGATION plus localizer. Total weight including power supply less than 9 pounds—4.1 kg.

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KI-200 OMNI LOCALIZER - CONVERTER/INDICATOR. Paired with the KR-40 or the KX-100, the KI-200 provides steering indication, indication on omni plus localizer, indication with airline accuracy of 2 degrees. Switches automatically between omni and localizer modes. A self-contained, transistorized unit. Weighs less than 2 pounds - 0.9 kg.

U.K. List price with 14 or 28 volt unit — £271.

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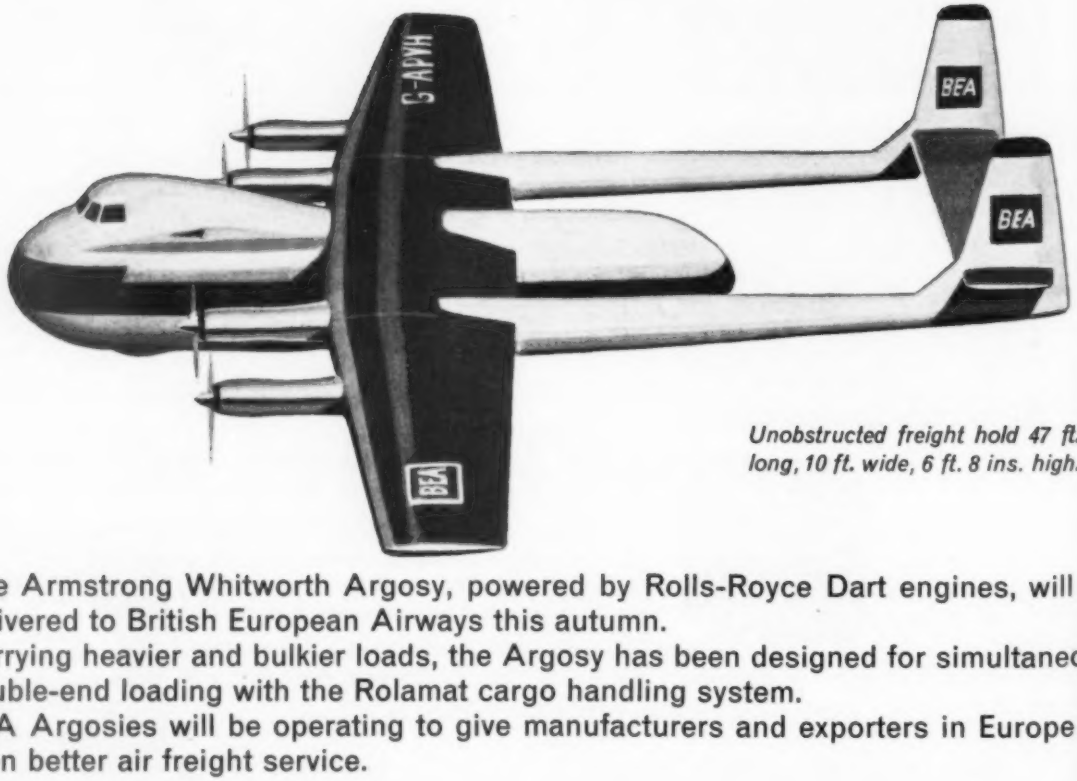

Unobstructed freight hold 47 ft. long, 10 ft. wide, 6 ft. 8 ins. high.

The Armstrong Whitworth Argosy, powered by Rolls-Royce Dart engines, will be delivered to British European Airways this autumn.
Carrying heavier and bulkier loads, the Argosy has been designed for simultaneous double-end loading with the Rolamat cargo handling system.
BEA Argosies will be operating to give manufacturers and exporters in Europe an even better air freight service.

HAWKER SIDDELEY AVIATION, 32 Duke Street, St. James's, London, S.W.1.

No 2729 VOLUME 79 THURSDAY 20 JUNE 1961

FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

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New Hope for the Independents

FUTURE historians of British air transport may well have cause to regard June 22, 1961, as a day of tremendous consequence, for on this day an impartial, if not entirely independent, Board decided to license a British independent airline to operate in direct competition with BOAC over the North Atlantic, plummiest of plum routes. The Board's decision is not yet final, because BOAC is to appeal, and this appeal, conducted by a commissioner appointed by the Minister, will be heard in public. Whatever the former recommends, the Minister has the last word. He can accept the appeal, reject it or order another Board hearing. There is, we think, insufficient realization that it is by no means a foregone conclusion that Cunard Eagle will get their licence. Further thoughts on this theme appear on page 909.

The immediate significance of the Cunard Eagle decision lies not so much in orders for British jet airliners, although these will, it is hoped, come later. What is so important about this decision is that material diversion has been seen by the Board in perspective—not as something likely to cause mortal injury but as something which airlines must learn to accept in the rough-and-tumble of air commerce.

Such striving between corporations and independents can benefit the travelling public, and the British aircraft industry. The Board itself, it should be added, has gained in stature and authority during its relatively few months of existence. It is particularly gratifying to record its optimism about future traffic growth on the Atlantic, and its belief that if material diversion were regarded as a bar to the grant of a licence, then no UK operator could be licensed for any route already served by another—thus "freezing" the existing situation, and making the Civil Aviation Licensing Act pointless.

Tigers at LAP?

A FEW weeks ago Roger Bacon printed on his "Straight and Level" page a photograph showing an Auster (ingeniously superimposed) flying over the control tower at London Airport, with the caption, "Big clubhouse they've got there, Fred." This splendid outing for Fred and his pal may in fact now come within the realms of possibility, with the Ministry of Aviation announcement (see "All Quarters," page 884) that "properly equipped" private, executive and non-scheduled aircraft are to be allowed to use London (Heathrow) Airport without prior permission during off-peak hours.

This is a symbolic victory for those—notably the Royal Aero Club and Business Aircraft Users' Association—who have so long and so strenuously advocated more freedom for non-scheduled and private aircraft to use major airports in the United Kingdom. Technically, the change is not great, for previously the airport could be used if 24 hours' notice were given; but in practice the disincentive has been great and any users but scheduled airline operators have been discouraged.

During the trial period of three months, it is up to those who make first use of this facility to do so responsibly; for a promise has been made that single-engined and light aircraft which are "less fully equipped," and whose pilots do not have an instrument rating, may use London Airport in VMC (visual meteorological conditions) and when traffic permits. This will be a facility worth having, and it is up to the better-equipped executive and private users to see that their initial usage creates a good impression.

FROM ALL QUARTERS

RAN Wessex Order

PROVISIONAL purchase of 30 Westland Wessex helicopters for the Royal Australian Navy was announced by the Australian Minister of Defence, Mr Athol Townley, in Canberra last week. The cost is estimated at £A6m (£4.8m sterling). Mr Townley said that certain tests had yet to be made before the order was finalized.

Cyrano for Australia

IT is now reported that the Australian Government has signed a contract for the supply of C.S.F. Cyrano fire-control radars to be fitted in RAAF Mirage IIIs. An Australian decision in favour of the Cyrano was reported, but not confirmed, some months ago, although Ferranti still appeared to be very much in the running with Airpass 2. It now seems clear that RAAF Mirages will be identical in all major respects with those ordered for the French Air Force.

Light Aircraft at Heathrow

FULLY equipped twin-engined private and executive aircraft flown by pilots holding an instrument rating may now use London (Heathrow) Airport without prior permission, except during peak times (totalling four hours daily for domestic flights and six hours for international flights) and except for periods of one week before and one week after all public holidays. This was the main message contained in the Ministry of Aviation's Civil Aviation Information Circular No 56/1961 dated June 21, which stated that this new arrangement was to come into force forthwith for a trial period of three months.

Although this concession will be welcomed as a step in the right direction, particularly by the Royal Aero Club and Business Aircraft Users' Association who have campaigned for some time for this type of assistance, pilots may be forgiven for gaining the impression from certain sections of the circular that the Ministry is perhaps not wildly enthusiastic about encouraging this type of non-sheduled air traffic. "London (Heathrow) Airport is provided primarily for the use of civil aircraft operating scheduled passenger and freight services approved by the Minister of Aviation," the circular begins. "London (Gatwick) is fully equipped and available for other types of flight," it continues. And, just in case any wrong impression is given, paragraph 1.3 puts him straight right away: "These revised conditions do not make the airport available for recreational or pleasure flying."

The times during which the airport is *not* normally available to non-scheduled aircraft are from 7.30 to 11.30 a.m. and 5 to 7 p.m. for international flights; and from 8 to 10 a.m. (take-offs) and 4 to 6 p.m. (landings) for domestic flights. During the remaining times when the airport can be used, the conditions are that the aircraft must have two or more engines; that it carries "all the required VHF/RT frequencies and radio aids to navigation in accordance with Article 10 of the Air Navigation Order, 1960, including ILS on all four London (Heathrow) Airport frequencies"; that the pilot holds an instrument rating; and that administrative or diplomatic clearance has been obtained where required. The lucky ones who qualify are further required to use the special call sign "Cigar" when contacting approach control (clearly someone at the Ministry believes himself fully aware of the true nature of business flights).

For the future, the circular holds out hope for aircraft and pilots which do not qualify under these conditions, and in particular for single-engined and light twin-engined machines. Trials are being made to evolve standard routes and procedures for these aircraft which will avoid long approaches over built-up areas and, when "satisfactory procedures" have been agreed (a further information circular is promised on this), these aircraft will be allowed in also, provided they have at least the VHF/RT frequencies to permit communication with the airport's approach director, tower and ground movement control—but then "only on special VFR clearances and in weather conditions which will permit the pilot to navigate by visual means."

Carvair on Test

THE first flight of the Aviation Traders ATL-98 Carvair is recorded on pages 890-891. As we close for press it is learned that the aircraft has flown at a weight of 69,000lb at heights of up to 10,000ft. It has been stalled at a 15° flap setting and with full flap, with undercarriage down. It was hoped to fly the Carvair to Filton this week for position-error checks. At the time of writing about seven hours' flying has been recorded, and a take-off at the maximum weight of 74,000lb was imminent.

Decca was used as a primary aid during flight trials and will be installed as standard in production Carvairs for Channel Air Bridge.

J. A. D. McCurdy

WE record with regret that John A. D. McCurdy, MBE, LLD, DCL, the pioneer pilot who designed and built the Silver Dart in 1908, with it making the first aeroplane flight in the British Empire on February 23, 1909 (at Baddeck, Nova Scotia), died last weekend at the age of 74. He was a director of the Curtiss Aeroplane Co from 1917 to 1919 and president of Curtiss Aeroplanes and Motors Ltd, Toronto, from 1914 to 1919. From 1947 to 1952 he was Lieutenant-Governor of Nova Scotia.

Denny Hovercraft Starts Trials

LAST Thursday the 4½-ton sidewall hovercraft built as a test vehicle for larger vessels by William Denny & Brothers Ltd made its public début on Gareloch, near Dumbarton. The purpose of this relatively large test vehicle, which carries a crew of three, is to investigate the performance and behaviour of the sidewall hovercraft layout for larger trading vessels capable of operating at about 35kt in rivers and estuaries. The air cushion is retained at the sides by continuous walls which remain immersed in the water and, at the ends, by inward-inclined air curtains. These and the main cushion air are supplied from four intakes by fans driven by two Excelsior Seafarer III 25 h.p. two-stroke engines. Propulsion and directional control are provided by two Mercury 35 h.p. outboard engines with variable-pitch propellers. The test craft is 60ft long and 10ft wide.

Advantages of the layout for commercial work are that the sidewalls make retention of the cushion, and therefore the lifting-power requirement, fairly low, while the cushion itself reduces drag and eliminates wash. The vehicle can therefore operate effectively in shallow and confined waters and against strong currents. The sidewalls are 1ft deep and the efficiency of the air curtains is indicated in the accompanying picture (below) by the small amount of spray generated.

The test vehicle will attain speeds of 15 to 17kt and will later be tested over a specially prepared measured-mile course in shallow water outside the navigation channel on the Clyde, near Langbank. Hovercraft Development Ltd are co-operating in the project. The sidewall principle was envisaged some years ago by Christopher Cockerell. Denny hope to develop a passenger-carrying "hover-ferry" by next year.

THE DENNY HOVERCRAFT (see Col 2) during trials on the Gareloch. Right, Mr C. F. Morris, technical director in charge of development

BULLDOG BARKS AGAIN: Installing the 1931 Jupiter engine in the Bristol Bulldog G-ABBB rebuilt for the Shuttleworth Trust and, at right, the completed aircraft at Filton with a test-bed Vulcan in the background. (See news-item below)

USAF UK Closures

FOUR United States Air Force bases in Great Britain are being closed. They are all operational stations for B-66s and RB-66s: Sculthorpe in Norfolk, where B-66s are based; and the three airfields which form the headquarters of the 10th Tactical Reconnaissance Wing (RB-66s)—Alconbury in Huntingdonshire, Bruntingthorpe in Leicestershire and Chelveston in Northamptonshire. These closures stem from the withdrawal of B-66s and RB-66s from operational service in Europe. Bruntingthorpe will be the first station to close, and USAF interest in it is to end completely. Alconbury, and later Chelveston and Sculthorpe, are to be reduced to "weather, communications and support services."

Caribou On Tour

A DEMONSTRATION tour covering portions of Europe, the Middle East and Africa is being made by the DHC Caribou. It follows a week spent in the United Kingdom, and will end when the aircraft returns to Hatfield about mid-July.

During the UK visit the Caribou showed off its STOL ability with loads ranging from 32 fully equipped troops to two Army jeeps or 14 stretcher cases. One of its appearances was at the Joint Services' demonstration on Salisbury Plain on June 7 (reported in *Flight* for June 15). The visit followed the Caribou's appearance at the Paris Salon, to which it had been ferried across the North Atlantic via Greenland and Iceland. On this flight, only the aircraft's standard fuel tanks were used, giving it a cruising range of 1,210 n.m. At Le Bourget, with the light (7/10kt) winds prevailing, take-off and landing runs averaged less than 300ft. Official take-off distance claimed by de Havilland Canada (at a STOL gross weight of 26,000lb, zero wind) is 540ft.

Bristol Air Race

A THICK sea fog covered Lulsgate aerodrome early in the morning last Saturday, depressing the spirits of competitors in the Bristol Air Race; but as the morning wore on it lifted and cleared and the rest of the day was unashamedly hot and sunny.

The occasion was very much a civic one: Bristol is proud of its airport. The arrival of the Lord Mayor and Sheriff (in full morning dress) and their ladies in a Belvedere opened the proceedings, and their eventual departure in a Sycamore closed them.

The Bristol Air Race was the main event on the programme. It was last held ten years ago when it was won by Ron Paine. On June 24 there were 19 starters, and the course was of three laps over about 16 miles: entries included HRH the Duke of Edinburgh's Turbulent, flown by Wg Cdr John Severne, the Beagle Terrier, and a Cessna 175 and a 210. The handicappers were very successful, and the finish in consequence spectacular. A. J. Spinner's Proctor was the winner, with Ron Paine close behind, almost repeating his victory of ten years ago. Third was S. M. Aron's very fast Miles Hawk Trainer.

The flying programme was an excellently balanced blend of old and new, fast and slow. Three famous biplanes largely stole the show—the Bristol Fighter, Gloster Gladiator and recently rebuilt Bristol Bulldog (see news-item and pictures above). The last-named was out of step from the others in that it was in civilian livery—one feels it would look much better in original military colours.

Very spectacular was a demonstration of an Auster and a Skeeter from 651 Light Aircraft Sqn, Army Air Corps. Other items included the Blue Diamonds, four Jet Provosts of the Central Flying School, and a Javelin, Gnat and Jet Provost from Bristol Siddeley.

Bulldog Flies Again

AFTER 25 years on the ground, many of them spent in the Science Museum in London, a Jupiter-powered Bulldog fighter of 1930 vintage has been restored by Bristol Aircraft. Its "first" flight was made by Godfrey Auty, the company's chief test pilot at Filton, late last week and the machine will probably be handed over to the Shuttleworth Trust later this year. Bristol Siddeley engines produced a Jupiter to Mk VII FP standard from a number of engines collected from cadet units and elsewhere. Many were sectioned and all were incomplete, but apprentices made the missing parts and the engine gave powers on the bench comparing favourably with those of the rating tests carried out in 1932.

The steel airframe was found to be in good condition, but aluminium and fabric skinning was replaced. For both engine and airframe restoration, long-service employees who had worked on the original production components gave assistance and advice. The aircraft's laminated-wood propeller was restored and the whole rebuilding operation took several years.

The aircraft was built in 1930 and shown at the Paris Salon in November that year. Until 1935 it was a sales demonstrator, powered by a Gnome-Rhone Jupiter IV. It last flew in 1936 as a test-bed for the Bristol Aquila sleeve-valve engine.

Canadian Autair Surveys

HELICOPTERS operated by Autair Helicopter Services Ltd of Montreal are currently engaged in high-altitude work for the Canadian Department of Mines and Technical Surveys. Three Sikorsky S-55s and a Bell 47-G2A are flying out of Isachsen in the third year of a 10/15-year programme of survey and research on the polar continental shelf; three S-55s are working on a topographical survey in the northern part of Baffin Island; and two Bell 47J Rangers are engaged in a gravity survey of the southern half of Baffin Island. The aircraft are equipped with Gyrosyn compasses, special ADF equipment, Decca Navigator units and "complete blind-flying equipment."

IN BRIEF

The last Lincoln in RAAF service made its final flight on June 14, from Townsville to Darwin.

The Hindustan HF-24, first Indian-produced jet fighter, made its maiden flight last Saturday. The aircraft is powered by two Bristol Siddeley Orpheus turbojets.

AICMA have changed their name following a decision to extend their activities to include space matters, and will henceforward be known as L'Association Internationale des Constructeurs de Materiel Aerospatial.

Another 90 Sikorsky S-58s have been ordered by West Germany. The order is worth nearly £10m and the aircraft supplement 50 already in service.

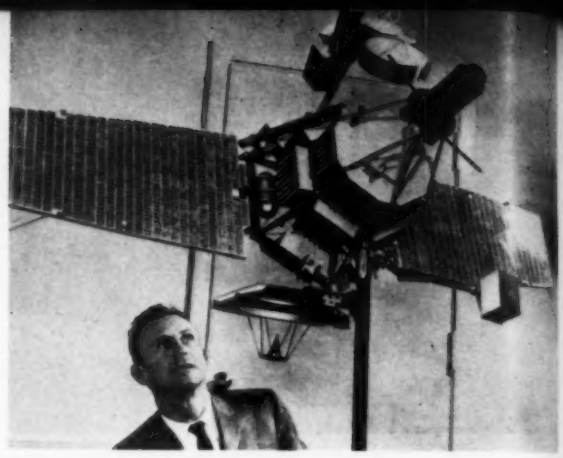
Four new radar bases are to be opened in Greenland by the USAF on July 1, replacing nine others in the Canadian Arctic and Labrador-Newfoundland region. The DEWline now stretches from western Alaska across Canada to Greenland.

In the report of Frank Beswick's interview with M. Hereil and Gen Ziegler in our issue of June 8 it was stated (page 816) that "Dassault has more experience with missiles." The word "missiles" should in fact have read "fighters."

Air Marshal Sir John Whitley, at present Inspector-General of the Royal Air Force, is to be Controller of the RAF Benevolent Fund in succession to AVM Sir John W. Cordingley on the latter's retirement at the end of May next year.

Fairey Air Surveys Ltd have been awarded a £250,000 air survey contract by the East Pakistan Water and Power Development Authority. It provides for the aerial photography and mapping of the western area of East Pakistan where agricultural production is regularly imperilled by flooding (during the monsoon season) and by drought.

It was announced in Bonn recently that the West German Commission responsible for advising the Federal Government on whether to accept or reject the Anglo-French satellite proposal has now submitted its report. It is unlikely that their findings will be published in detail, but their basic yes/no decision may well have been disclosed by the time this issue appears. Several other national decisions are thought likely to hinge upon what the Germans do.



Robert J. Parks, planetary programme director for Jet Propulsion Laboratory, examines a quarter-scale model of NASA's 1,000lb Mariner-A spacecraft designed to investigate the region of Venus. Atlas-Centaur will be used to launch the craft on a three-month journey to Venus late next year, according to present NASA schedules

Missiles and Spaceflight

EUROPE IN SPACE

The most thorough open discussion yet of all aspects of possible and actual European co-operation in space activities was due to take place earlier this week in London at a European Symposium on Space Technology sponsored jointly by the British Interplanetary Society and the Société Française d'Astronautique. Although initially planned before the official Anglo-French government proposals for a joint launch-vehicle programme were put forward at Strasbourg, the London meeting was expected to remove many of the doubts concerning such a co-operative effort, which in the last two weeks had appeared to be heading towards firm acceptance by the major countries concerned.

The purpose of the symposium was outlined by the organizers as follows:

"To draw attention to the following:

1. Future trends in the development of spaceflight, particularly a review of future possibilities related to West European capabilities but taking into account advanced studies which need not call for very considerable budgets, e.g. structural and propulsion problems, control engineering, etc.

2. Applications of space technology in the civilian field, e.g., communication and meteorological satellites.

3. The effects of space technology on the present structure and level of industry, particularly of an international nature, with consideration of political and economic aspects."

The symposium was due to be opened on Monday last, June 26, by Dr W. R. Maxwell, President of the BIS. On that and the following day technical papers on the first and second of the above subjects were to be presented, while Wednesday, June 28, was to be devoted to discussion of items in the third category. The full list of papers is as follows:—

New Type of Navigational Satellite, G. J. Broussaud, Compagnie General de Telegraphie sans Fil

The Necessity for a Meteorological Rocket Network in Europe, H. Faust, Deutscher Wetterdienst Zentralamt

Dynamics and Engineering of Satellite Attitude Control Systems, B. Stewart and P. A. E. Stewart, Advanced Projects Group, Hawker-Siddeley Aviation

The Attitude Control of an Astronomical Satellite, J. R. Fell, Elliott Brothers (London)

Digital Methods of Satellite Communications, S. C. Ghose, EMI Electronics

Aerial Problems in Space Communication, F. Charman, EMI Electronics

The Blue Streak Propulsion System, A. V. Cleaver, Rolls-Royce

Comparaison Entre les Systems d'Alimentation des Moteurs d'Engins Spatiaux, L. Melin, Société d'Etude et de Realisation d'Engines Balistiques

Influence du Ballottement des Liquides sur le Pilotage des Fuseés Porteuses, P. Polack, Société d'Etude et de Realisation d'Engines Ballistiques

Cryogenic Supply Facilities, J. B. Gardner, British Oxygen Co

The Impact of Space Propulsion Technology on the Engineering Industry, M. S. S. Hunt, Bristol Siddeley Engines

Application of Electric Propulsion to Satellite Control, P. C. McNeill, Elliott Brothers (London)

A Lightweight Solar Propulsion Unit for Transfer to a 24hr Orbit, P. A. E. Stewart and J. F. Swale, Advanced Projects Group, Hawker-Siddeley Aviation.

Les Problèmes d'Optimisation des Vaisseaux Spatiaux Propulsés par Plasma, M. Colombani, SNECMA

Application of Rotary Wing Techniques to Atmospheric Re-entry and Launch Vehicle Recovery Problems, M. Kretz, Giravions Dorand

Political and Economic Background to Space Co-operation, David Price, Member of Parliament

Space Engineering and European Collaboration, Air Cdr F. R. Banks, Hawker Siddeley Aviation

New Aerospace Technologies, F. Vinsonneau, Société d'Etude et de Realisation d'Engins Balistiques

A European Space Programme, L. R. Shepherd, UK Atomic Energy Authority

Legal Problems arising from a Co-operative Space Programme, J. L. Weinstein, OEEC, Nuclear Energy Agency

The Implications of not having a European Space Programme, A. V. Cleaver, Rolls-Royce

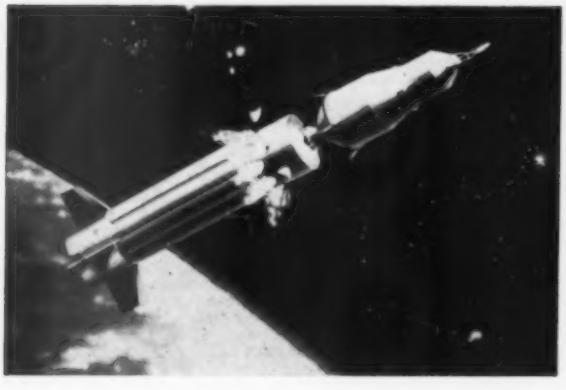
Practical Uses of Space Vehicles, G. K. C. Pardoe, de Havilland Aircraft

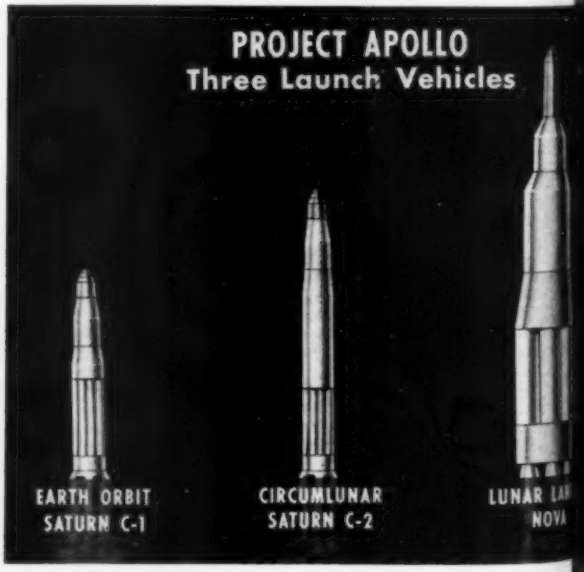
Australian Contributions to a European Space Programme, H. J. Higgs, Weapons Research Establishment

The European Organisation for Nuclear Research (CERN), Dr Ir C. J. Zilverschoon, CERN

US Co-operation in Space Research and Exploration, Dr A. W. Frutkin, US National Aeronautics and Space Administration

In Project Apollo, Saturn C-1 will be the booster for initial Earth-orbital missions at an orbital altitude of 150-300 miles. Second-stage separation from the booster is depicted below. For circumlunar flight the more powerful Saturn C-2 will be used, as illustrated in the diagram at right. The third launch vehicle shown in this illustration is a conceptual version of Nova, approximately to the same scale as the two other rockets, which will be used for manned landings on the Moon





SPACE CONGRESS DETAILS

A tentative programme for the 12th Congress of the International Astronautical Federation, to be held in Washington, DC, during October 2-7, has been published by the organizing body, the American Rocket Society. Congress papers will be divided into seven categories—astrodynamics and guidance, communications and instrumentation, propulsion, vehicle design and testing, space exploration, human factors and biological environment, and space law. These subjects form the basis of both conventional and technical sessions, at which formal papers will be presented, and "round-table discussions" covering several specific topics, on October 3, 4 and 6.

On October 2 the official opening ceremony will take place, together with a meeting of the Academy of Astronautics and IAF plenary sessions. On October 5 the technical programme is interrupted for a boat tour to Mount Vernon, and possible visits to company facilities in the Washington area are planned for October 7. Congress participants are being invited also to the ARS "Space Flight Report to the Nation" programme of technical sessions and exhibitions which is being held during the following week (October 9-15) in New York.

Chairman of the organizing committee for the Congress is Prof Samuel Herrick, and the current President of the IAF is Prof Leonid Sedov of the Soviet Union. Scientists and engineers in the United Kingdom wishing to attend or to present papers at the congress should contact the British Interplanetary Society, 12 Bessborough Gardens, London SW1. The Society hopes to arrange a special charter flight for members attending the congress.

Displayed at Sunnyvale, California, is a full-scale model of a 250,000lb thrust, conical, segmented, solid-propellant rocket motor which United Technology Corp expect to test-fire this year. It is 36ft 6in long and 10ft at its widest

ACADEMY DISCUSSES SPACEFLIGHT TRAJECTORIES

THE International Academy of Astronautics is a recent addition to a family of organizations with somewhat similar names. It was born of the International Astronautics Federation, and this in turn had a mixed parentage—out of Unity by concerted action of the many national groups like our own BIS, as they would say on the racecourse. The Guggenheim Foundation has played the rôle of the beneficent godparent in donating funds and office accommodation, but only for three years, after which the infant must find its own way in the world. With its home in Paris, it aims to be a French-style Academy; not a school, but a society of *savants*. "Maybe in 100 years' time," says its distinguished Director, Dr von Karman, "it will be as respectable as the Royal Society." Its membership is naturally, therefore, restricted to a few of the élite from each country—unfortunately not yet including any from the USSR, who prefer to wait and see how the Academy grows up.

The Academy last week convened its first symposium, devoted to *Spaceflight and Re-entry Trajectories*, at Louveciennes, ten miles out of Paris. The meeting was attended by some 80 guests, about half of whom came from abroad (including a strong representation from the USA). The meetings took place in a country club, in as pleasant a terrestrial setting as could be imagined; the invitation to bring tennis rackets and bathing trunks, however, seemed to go unheeded. Indeed, there was a seriously attentive audience for all the 16 technical papers which were read and discussed, a fact gratifying to all concerned, especially (as the Director remarked) since it is sometimes more difficult to listen than to talk.

Dr von Karman, the loved and respected grand old man of aerodynamics, has recently passed his eightieth birthday, and to mark the event he was presented with a specially dedicated issue of *Astronautica Acta*, which he accepted during the opening ceremony (June 19) as "a good engineering approximation—one part in a thousand—to the true date (May 11)." He pointed out that the aims of the Academy were to discuss" possibilities and feasibilities" rather than proven pieces of hardware—aims nicely realized by the choice of the rather academic subject of trajectories. He quoted a remark by Hugh Dryden that "to be a prophet was not a scientific profession," but said that he himself only deplored negative prophesy.

He recalled that, when he first came to Paris in 1908, there was then exactly the same excitement and scepticism about aeronautics as there was now about astronautics: fliers were considered "half engineers, half fools", and the stories of flights in the US were "bluff." Negative prophesy was rife: even Lanchester, whose famous treatise was published that year, dismissed the practicability of large aerodromes, and suggested that an airport be one part for runways, the other part for cows. "Such pessimistic predictions soon became ridiculous," commented Dr von Karman. There was no shame in optimistic imagination—if exercised intelligently, it was the mainspring of scientific advance.

The technical sessions were opened in a suitably forward-looking manner by a discussion of *Trajectories for Interplanetary and Lunar Missions*. Dr J. M. J. Kooy of the Royal Military School of Breda, the Netherlands, pointed out that for research purposes it would be desirable to slow down planetary probes in the neighbourhood of their target planet, so that they would be captured by the gravitational field and become artificial satellites. This would be a hazardous manœuvre, because it was difficult to get any satisfactory orbital information over such vast distances and, at least in the first attempts, insufficient would be known about the planet to assess which close-orbit would be beneficial or, indeed, precisely what rocket impulse would be needed to produce it, even if it were known.

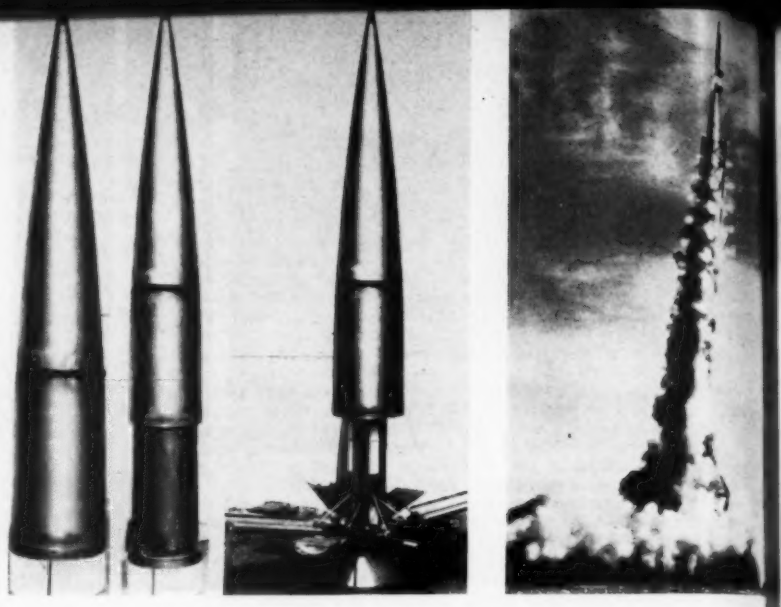
The solution he suggested was that the vehicle be divided into four separate parts, each following close upon the other in the initial orbit away from the Earth, whose characteristics could be established with good accuracy while the combined group was still relatively close to us. Close to the target planet, one of these vehicles alone would be commanded to go into a satellite orbit, and its progress could be closely and accurately watched by a radar doppler beacon in the other three vehicles. The data would be telemetered back to Earth, and Dr Kooy's mathematics showed how the orbit of the first vehicle could be computed. The other vehicles could have their orbits changed in their turn, still using a beacon system between the other three. Physical data from the first, moreover, could be interpreted perhaps in time to allow a better orbit to be selected. But the long time it would take for the radio signals to reach Earth was a handicap to the prompt action needed.

It was encouraging to discover Mr H. Hiller, from the Royal Aircraft Establishment, giving details of very extensive calculations made there on orbits round the Moon: he mentioned an accuracy in the direction of velocity at all-burnt of $\pm 0.2°$ as a requirement if it was intended to hit the moon (anywhere), and later papers from the American speakers showed that they are thinking of easing this problem of extreme accuracy by first placing the lunar landing vehicle in orbit about the Moon, and then making the descent after the shape of this orbit had been properly studied.

A NASA delegate, Mr W. E. Moeckel, talked of the consequences of electric propulsion (ion rockets) in relation to interplanetary trajectories, whereby very small accelerations (some 10^{-3} to 10^{-4} Earth gs) were derived from a jet of ionized particles accelerated in an electrical field. He used weight estimates of 10lb/kW for the powerplant, and it would be interesting to know whether this "guess" was informed or not, as such novel propulsion schemes are being studied in the US. But, as an American friend frankly admitted, "we are not allowed to talk about anything really new or technically valuable at these [unclassified] meetings." Nonetheless, the American contributions are always notable for the quantity of data, and the hard work their preparation must (at one time) have entailed.

Mr John Houbolt, also of NASA, explained how one Earth satellite might "rendezvous" with another—a term which can have many connotations, including unfriendly ones. The hunter might "park" in a convenient orbit whilst the "hunted" takes its inevitable course which will bring it into a suitable position for the final chase; and it was interesting to hear of primitive devices like telescopes, timers and plumb-bobs, which could be used by a pilot in the hunting vehicle to home on to his quarry (as well, of course,

Missiles and Spaceflight . . .



An ingenious nosecone was used in the June 6 launch from White Sands, New Mexico, of an Aerobee-Hi rocket designed to obtain and recover specimens of dust and micrometeorites from heights between 40 and 105 miles. At 40 miles the outer nose-section moved forwards and the eight folded panels extended outwards, as shown. The panels remained open as the rocket coasted to its apogee of 105 miles and descended to 55 miles, when they were retracted and the outer section drawn back prior to recovery by parachute. (See "Micrometeorites Captured")

as more-sophisticated electronic devices involving the application of proportional navigation).

The question of the best way to employ rocket propellants in space is still apparently unsettled. Prof D. F. Lawden, back in Europe for the first time since he went to Canterbury, New Zealand, is one of the pioneers of this field of investigation, and perhaps the leading authority. For many years he has contended that one must drive interplanetary vehicles like the Paris taxi-man does his cab; foot hard down on the accelerator, or else the brake—maximum rocket thrust, or none at all, in a specially calculated programme. Now, however, he has discovered that this may not always be best, but the matter is still *sub judice*.

Mr D. G. King-Hele of the RAE is much in demand at meetings like this, as his work on the evaluation of atmospheric properties from the observation of Earth satellites has deservedly earned him worldwide esteem. He is these days getting down to the finer points of his study. One interesting reflection of the dependence on upper-air properties on solar activity is that the atmosphere has contracted since the peak of the Sunspot cycle: there is now only a third of the air at 200km height that was measured to be present there in 1958. Mr King-Hele (6ft 3in in his socks) should be one of the first to feel the effects if the trend continues.

Another apparently unexpected effect of the Sun on satellite behaviour was evinced by the behaviour of Echo I, the American balloon. The pressure of light is, of course, something not usually felt, although for a long time the physicists have assured us that it exists. Small effect that it may seem, it had a profound effect on the orbit of this particular satellite, with the result that the Echo will stay in orbit for perhaps another 20 years (instead of several months, as at one time thought), although, punctured by micrometeorites, it is now deflated and useless. Prof K. Schütte, the Munich astronomer, had a comment to make about this.

The aerodynamicists had their say about re-entry problems on the last day. Mr J. V. Becker of NASA described the manœuvres of a winged vehicle coming into the atmosphere from space: if it entered too high (an overshoot) or too low (an undershoot) he showed how it was possible, by rolling the aircraft to one side or the other (rather, perhaps, than by adjusting its incidence) to adjust the glide-path to make landfall at or near the required spot. The roll would adjust the rate of descent (as well as direction) but would leave the airflow unaltered, as was desirable if unexpected aerodynamic heating problems were to be avoided. He also alluded to such vehicles as being piloted by humans possibly without electronic aids, by "the seat of the pants," in fact; and showed that this had been accomplished in simulator studies, despite the unusual behaviour of aircraft controls at the very high speeds involved.

In his concluding remarks Dr von Karman rejoiced that the pilot still had his uses, and recalled that a test pilot had once asked him, "Who can build an autopilot weighing only 150lb, having a working life of several years, and *produced by unskilled labour*?" The next symposium of the Academy, in 1962, has as its subject *Man in Space*.

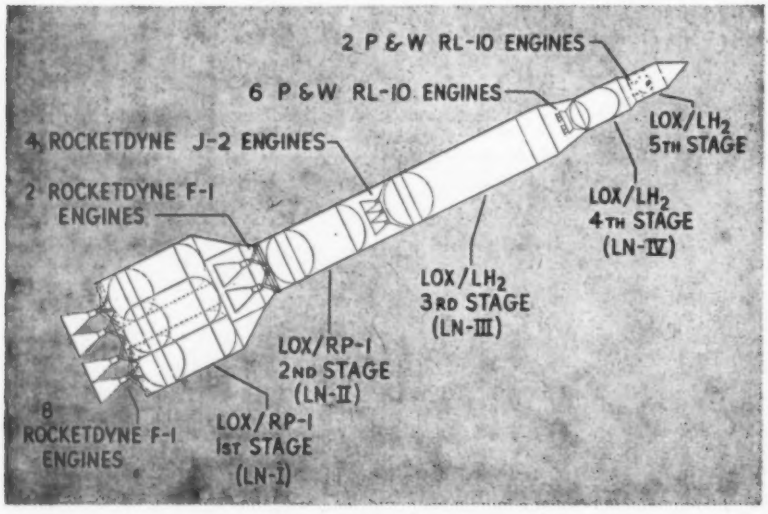
T. R. F. NONWEILER

MICROMETEORITES CAPTURED

Illustrated at the head of this page is the experiment carried out on June 6 by the US Air Force Cambridge Research Laboratories to recover specimens of dust and micrometeorites from an altitude of over 100 miles by means of an Aerojet-General Aerobee-Hi research rocket. The launching was carried out at the Naval Ordnance Missile Test Facility at White Sands, New Mexico, with the operating sequence as outlined in the caption to the photographs.

The equipment designed to obtain the specimens comprised boxes containing electron-microscope screens and triple-layer strips of plastic material on each of the petal-like panels. Also carried in the nose section was a 16mm camera, a radio beacon for tracking purposes, and the parachute recovery system (which operated at 20,000ft with a pilot parachute and 10,000ft with the main chute).

Since the first Aerobee launch in November 1947, more than 300 Aerobees have been fired. Aerojet's family of operational sounding rockets consists of the Aerobee 100, 150, 150A and 300, in addition to the more-powerful solid-propellant Astrobee 200, 250, 500 and 1,500.


2 P & W RL-10 ENGINES
6 P & W RL-10 ENGINES
LOX/LH2 5TH STAGE
4 ROCKETDYNE J-2 ENGINES
2 ROCKETDYNE F-1 ENGINES
LOX/LH2 4TH STAGE (LN-IV)
LOX/LH2 3RD STAGE (LN-III)
LOX/RP-1 2ND STAGE (LN-II)
8 ROCKETDYNE F-1 ENGINES
LOX/RP-1 1ST STAGE (LN-I)

One concept for NASA's gigantic Nova launch vehicle is the five-stage version here illustrated, which uses a cluster of eight Rocketdyne F-1 engines as first stage, two F-1s as second stage, and upper stages as indicated. The vehicle would be over 330ft high and would have a first-stage diameter of 65ft. Four-stage and six-stage versions are also being studied, and the latter would be some 396ft high

A metallized re-entry vehicle model is prepared for radar-reflection testing in the anechoic chamber in the electronics laboratory of Republic Aviation's new research and development centre at Farmingdale, New York. Other laboratories in the centre include those devoted to space environment, re-entry simulation, guidance and control systems, and plasma propulsion

BLUE STREAK HELPS TITAN

When we published our account, on May 25, of some of the problems which Martin had to solve in firing a Titan ICBM from the bottom of a silo, we did not know that the engineers at Denver were assisted by work done by de Havilland Propellers (as the company then was) under the Blue Streak programme. Our transatlantic contemporary *Missile and Rockets* writes:

"Studies made by the British in 1956, when they were considering a silo system for the Blue Streak missile, contributed substantially to early US studies in ducted launchers for liquid rockets, according to Titan project engineers. The British first operated their scaled-down thrust chambers on cold gas, later shifted to hydrogen peroxide and kerosine and the Gamma rocket engine. Contributions were made by the British in the areas of drift envelopes and air entrainment."

Drift envelopes are three-dimensional plots of the envelope required to contain the missile as it leaves the silo, making due allowance for every possible factor capable of giving rise to lateral disturbances—such as misalignment of launcher, engine thrust-axis deflection, wind and other variables. Air is entrained by the rocket flames issuing from their separate ducts, the exits from which could be seen flanking the silo mouth in the illustration to our article previously referred to. It was found that for best entrainment the area of all exhaust ducts (usually two) should equal 70 per cent of that of the silo exit.

SATELLITE SYSTEM FOR COMMUNICATIONS

Details of Communications Satellites Inc, the recently formed company sponsored by US General Electric, were given in London recently by Mr R. P. Haviland, an engineer with the Military Space Vehicle Department, Defense Electronics Division of GE. The announcement of the formation of the satellite company was reported in *Flight* of May 18.

Communications Satellites Inc had applied on May 1 to the Federal Communications Commission, for permission to go ahead with its proposed co-operative scheme for operating a communications satellite system, Mr Haviland said, and hoped to receive an answer by the end of this year. The application was of necessity incomplete because of the complexity of the scheme and the need for inter-industrial and inter-governmental agreements, which could not be concluded without an FCC go-ahead.

The company hoped to own and operate a ring of ten satellites in equatorial orbit. Satellite communications would supplement cable services but would increase both the quality and capacity of present communications. General Electric's initial outlay for the company had been $1m, and it was expected that another $50m would be provided over the next seven years. The total investment in the new company over this period would be $270m, which would cover the development period and the first year of full satellite operation. The tentative programme included first satellite launchings in 1963, initial operations in 1964, and full operation beginning in 1965-66.

Active satellites would be used, since passive ones were believed to have too low a capacity to be economical. The GE company believed that every major technical problem raised by the scheme had been solved at one time or another, and what remained to be done was to combine the requisite items of experience into one technology. The satellites would orbit at a height of 6,000 n.m. with a true orbital period of 6.33hr (or 7.5hr apparent period). Each satellite would weigh about 1,000lb, with a largest dimension of 25ft. Precise station-keeping would be accomplished by adjusting the positions of the satellites while in orbit.

Cost estimates for the system were based on a useful life for the satellites of one year, one month of which would be taken up by adjustment of satellite orbit, although it was hoped that a five-year useful life could be obtained. It was also assumed that five to seven launchings out of ten would be successful, and that costs per satellite in orbit would be about $3½m for the satellite and about $8m for the booster. A drift of ±1° per year was anticipated. Ground-to-satellite transmissions would be on a frequency of 6,000Mc/s, and transmissions from the satellite would be on 4,000Mc/s. The initial set of satellites was expected to be satisfactory for relatively short television transmissions, but eventually fulltime television relay was expected. Up to the present time Communications Satellites Inc had met with overall technical agreement in talks with the British GPO, but no discussion of business or administration problems had yet taken place.

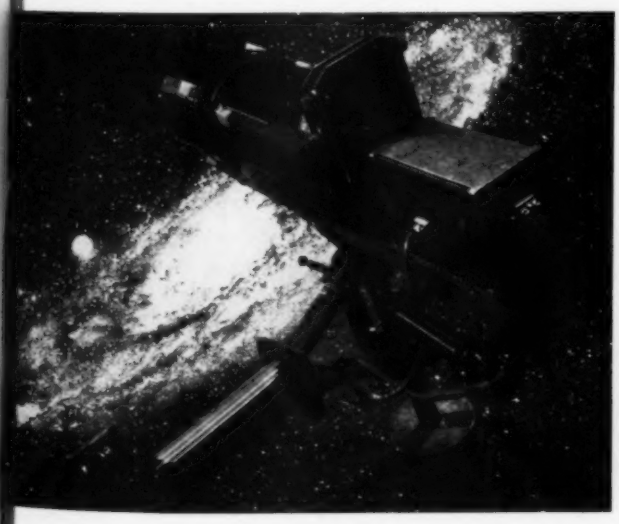
In the company's application to the FCC, 1,200 high-quality voice channels were requested for the first satellites, in addition to one television channel. There would also be 300 voice channels of lower quality for use by countries whose communications facilities were relatively undeveloped.

Nine companies have been contacted by Communications Satellites Inc for initial discussions. They are: American Securities Corporation, American Telephone & Telegraph Co, General Telephone and Electronics Corporation, Hawaiian Telephone Co, International Telephone & Telegraph Corporation, Lockheed Aircraft Corporation, Press Wireless Inc, Radio Corporation of America and Western Union Telegraph Co.

SPACE RADIO CONVENTION

"Radio Techniques and Space Research" is the theme of this year's convention of the British Institution of Radio Engineers, which is to be held next week (July 5-9) in Oxford. Sessions will be devoted to radio techniques in space research, satellite engineering, extra-terrestrial measurements, techniques in radio astronomy and communication satellites.

Minneapolis-Honeywell's aeronautical division at St Petersburg, Florida, have been awarded the "multi-million dollar" research and development contract for the Dyna-Soar secondary attitude-reference subsystem. This will consist essentially of a stable platform, platform electronics and a platform-attitude programmer, and will be used to monitor the primary guidance and provide for safe return in the event of malfunction in the primary system.



This star field tracker has been developed by the Martin Co for the navigation, stabilization and guidance of spacecraft. Instead of relying on co-ordinated fixes on a number of individual stars or planets, the Martin instrument involves map-matching against any selected constellation or group of stars

CARVAIR'S MAIDEN FLIGHT

REGISTERED G-ANYB, the first Aviation Traders ATL-98 Carvair took off from Southend Airport at 8.26 on the morning of June 21 on its first flight. At a weight of 54,000lb the run was a mere 300yd. The Carvair landed exactly 2hr later, using only 3,500ft of the 5,265ft long 06 runway. The only snag reported was a sticky microswitch on the undercarriage uplock. The pilot was Mr D. B. Cartlidge, one of Aviation Traders (Engineering) Ltd's two senior pilots, and Capt R. Langley acted as first officer and stand-by pilot. Mr Don Cartlidge is a graduate of the Empire Test Pilots' School and Capt Bob Langley is an experienced DC-4 route captain with test-flying experience. Capt Langley is managing captain of Channel Air Bridge. The third member of the test team was Mr K. W. Smith, Aviation Traders' flight test engineer.

A company release issued on the day of the first flight states that during most of the flight the behaviour of the new passenger-and-vehicle transport was watched by Capt L. P. Griffith, the company's other senior test pilot, flying an accompanying Cessna 310D. Also on board the observation aircraft was a technical director of Aviation Traders, Mr J. R. Batt; the chief designer, Mr A. C. Leftly; and the chief inspector, Mr C. W. Murrell.

"Auto-observer and camera equipment is carried in the prototype Carvair," the report continues, " and there are trace recorders to measure control-surface angles, stick forces and trim-tab deflections. Provision is made for water ballasting and jettisoning by means of tanks installed in the fuselage, but on this first flight the aircraft was flown at a mid-c.g. position and at the light weight of 54,000lb at take-off.

"During the first flight the pilots carried out a preliminary assessment of handling qualities. In particular, they studied aerodynamic effects of the pronounced hump on the forward fuselage which enables up to six cars to be loaded through the nose. Wind-tunnel tests have already been carried out at the College of Aeronautics, Cranfield, on a model of the Carvair, and, for comparison, on a model of the DC-4, of which the Carvair is a modification. These tests were satisfactory.

"Flight tests this morning were conducted at heights between 2,000ft and 6,000ft, with the aircraft flying at speeds of up to 210 m.p.h. Control circuit friction and control effectiveness were assessed, and the aircraft was side-slipped through small angles for a first check on the extended fin and rudder. Subsequently Capt Cartlidge flew the aircraft below 97 m.p.h. and at a low power-setting to examine the behaviour near the stall—in particular, the

The views on this page show aspects of the Carvair which stamp it as an aircraft of character if not of pulchritude

The first take-off, at a light weight of 54,000lb, was achieved in 300yd

effectiveness of the controls and the first onset of buffeting. No full stalls were attempted on this first flight.

"Another preliminary investigation concerned the speed at which the aircraft will cruise. Data collected during the flight has yet to be fully analysed, but it is expected that the drag penalty of the new nose will amount to about 11-12 m.p.h. and that the aircraft will cruise at over 200 m.p.h. at 65,000lb weight. Maximum weight of the Carvair, at 73,000lb, is identical with that of the DC-4 and the structure is stressed to the same never-exceed speed of 250 m.p.h. Weight penalty of the new nose and tail is about 1,500-2,000lb, but, as a result of savings elsewhere, equipped weight is about the same as that of the DC-4."

A number of overseas airlines have already expressed interest in the Carvair—a conversion of the DC-4 costing £150,000. The makers remark that this type of aircraft is not prone to fatigue troubles and the work includes a thorough overhaul and minute inspection of the airframe. Engines are P & W R-2000 Twin Wasps.

Of the ten Carvairs ordered by Channel Air Bridge the first should enter service this autumn. They will fly passengers (with a high degree of comfort, it is predicted) and cars from Southend to new destinations deep within the Continent—Lyons, Strasbourg, Düsseldorf, Bremen, Basle and Geneva. Fares should again be reduced on Channel Air Bridge routes when Carvairs are in service

JETS FOR MATS

MATS, the Military Air Transport Service of the United States Air Force, is often half-humorously referred to as the world's largest airline. That this underprivileged "airline" has been forced to operate without the benefits of jet aircraft has long been a source of discomfiture to its members. Expression of their feelings over operating world-wide with a fleet of 996 propeller-driven aircraft has been constant and bitter. By Department of Defense definition, the MATS mission is to provide "strategic airlift to move men, weapons, and materiel in accordance with US national strategy from one continent to another." Typical USAF criticism of their ability to carry out this role is evident in such open public pronouncements as "MATS is currently hampered in its reaction time by lack of jet transport aircraft."

While the desirability of modernizing MATS has been the subject of many discussions, no money was forthcoming until the Kennedy administration moved in. The new frontier took heed of the need and set the dollar wheels in motion to provide jets for MATS. By far the largest investment will be in the Lockheed C-141, now in the design stage, but in February of this year the USAF signed a contract with Boeing to provide 30 Boeing C-135A aircraft for "about 89 million dollars"; and the first aircraft was delivered on June 8.

Dubbed the Stratolifter, the C-135 is derived from the KC-135 tanker, of which about 460 are currently flying a refuelling role for the Strategic Air Command. The USAF is happy with its KC-135s so there is little to do to change the tanker into a cargo carrier. In fact the first C-135 rolled down the tanker line at Boeing's Renton, Seattle, plant until it was decided to make a cargo carrier out of it. In fact, this first machine still has the fuselage bulge and window for a refuelling operator, and all C-135s have provision for the transfer-fuel tanks. All dimensions are the same as the tanker, a descendant of the original prototype "dash-80" 707 which first flew in July 1954.

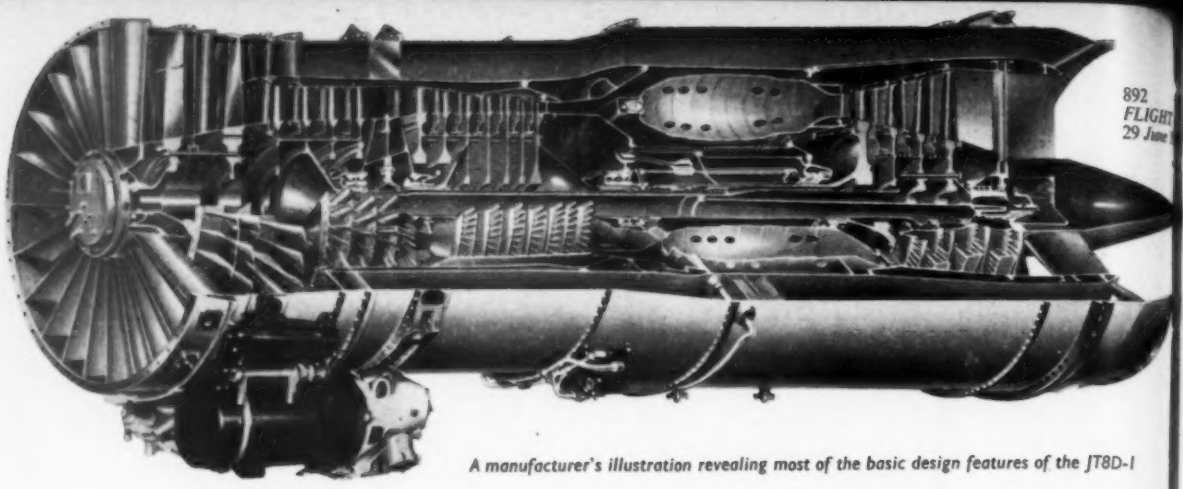
Internally, provision is made for a crew of six (three pilots, navigator, engineer and loadmaster) and for 126 seats or 44 litters and 56 walking patients. Comfort is not held a prime requisite, since soundproofing has been held to a minimum and of windows there are none. The expense for a design change involving windows for the troops overcame any desire to let the latter see where they were going. This is a chilling thought on an-across-the-world mission and it is likely that the 126 souls transported this way will have little desire to stay inside once their destination is reached, even if it means going to war.

The C-135 has a metal floor, with a cargo-pallet transfer plate abreast of the large loading door already fitted to the tanker version forward of the port leading edge. In this way, pallets can be swung up through the door and then right-angled down the fuselage. Payload capacity is billed by Boeing as 55,000lb for a non-stop distance of "more than 4,000 miles" or 35,000lb for "more than 5,000 miles." Boeing persistently claim a 600 m.p.h. capacity for their Stratolifter, but MATS is more conservative and refer to 460kt or 529 m.p.h., undoubtedly a realistic cruise speed at an average cruise altitude of 35,000ft. MATS list "optimum payload" as 38,000lb and maximum payload as 89,000lb. MATS give the range with optimum payload as 3,200 n.m. (3,600 miles). Gross weight is 272,000lb. Aircraft manufacturers can sometimes be accused of being over-optimistic in their presentation of performance figures, while the users have to face the realities of day-to-day operation.

Production rate for the C-135 is given as two per month. The first 15 are to be powered by the time-proven Pratt & Whitney J57-P59W, producing 13,750lb take-off thrust with water augmentation. The second production batch of 15 will use Pratt & Whitney TF33 turbofans (JT3Ds in civil life), producing 17,000lb take-off thrust and giving an approximate 15-20 per cent improvement in efficiency over the J57. [As we go to press, $21m is earmarked for TF33s to improve the first 15 aircraft—Ed.] MATS hopes are high for their initial order of 30 machines being expanded by an additional 20, to make 50 in all. This would absorb another $60m and, despite appearances to the contrary, such money does not come easily.

In a comparison of performance capability between the propeller-driven MATS of today and the jets coming up, Lt-Gen Joe Kelly, MATS Commanding General, said: "Civilian jet aircraft of this general type [a reference to the 707] demonstrated their high efficiency on the UN Congo airlift by flying the round trip between Europe and the Congo in a single day—while the eleven-year-old C-124 Globemasters of MATS, allowing for refuelling stops and necessary crew rests, required almost five days for missions of the same distance." The general sounded quite proud to be heading what would one day be the world's largest jet airline.

"In fact, this first machine still has the fuselage bulge and window for a refuelling operator. . . ." The only jets previously delivered to MATS were the three VC-137A (707-120) VIP transports, often used by the President and senior civil and military staff



A manufacturer's illustration revealing most of the basic design features of the JT8D-1

JT8D

Pratt & Whitney's Latest Engine

JUST as the Boeing 727 could be dismissed as a copy of the de Havilland Trident, so could its powerplant be brushed aside as a copy of the Rolls-Royce RB.141. Both suggestions have been uttered publicly; and by people who ought to have known better, for there is little truth in either assertion. The most that can be said is that the answers arrived at by the Boeing Company's transport division and Pratt & Whitney Aircraft are flattering confirmation of the soundness of prior British design thinking; and the design of the JT8D would probably have been pretty much the same if Rolls-Royce had never existed. It is, however, fair to comment that if Rolls-Royce had indeed never existed, the pressure on the engineers at East Hartford would have been less relentless, and the JT8D programme might not have materialized for some years to come.

Although all the basic design-parameters of the JT8D run very close to those established by Rolls-Royce in the RB.141, so that the final engine bears many points of similarity with the smaller and later Spey, the thread of development can be clearly traced back through the JT3D, JTF10 and other projects right back to the original JT3. Like the earlier JT3D, the new engine is an essentially conservative design, showing that the basic traditions of Pratt & Whitney Aircraft are in no way being sacrificed to achieve commercial success. In fact, the company are making great play of this conservatism, although one is led to suspect that they might run the engine a little hotter if they could produce air-cooled blades, as can Rolls-Royce. They say "JT8D's conservative temperatures permit use of solid turbine blades and guide vanes for greater durability . . ."; for an astute salesman has always been able to put the cart before the horse and present a handicap as an advantage.

Another aspect of the JT8D's conservatism lies in the steel and titanium construction of all the major portions of the rotating assembly and carcase. It is claimed that the use of these materials in the compressor rotor "minimizes foreign-object damage and permits blade profiles which result in better compressor efficiency." Rolls-Royce, while employing similar materials throughout the later stages, continue to adhere to light alloy for the first compressor stage in order to facilitate visual detection of foreign-object damage before local notch-stresses can lead to fatigue failure. As the cutaway drawing—previously unpublished—reveals, the first compressor spool incorporates the two fan stages, each of which has 35 titanium blades held by rounded dovetails broached in the disc. Each blade has an integrally forged shroud located at about 61 per cent of the span between root and tip, mating with the shrouds on adjacent blades as in the JT3D family. Another design detail is that the axial-thrust loads of each major rotating assembly are in both cases carried by a double ball bearing, either half of which is stressed to handle the complete task.

It is noteworthy that Pratt & Whitney have at last discarded the familiar hollow-centre annular flame-tubes, of which eight are used in each of their current commercial gas turbines, in favour of a simple cylindrical liner more akin to normal British practice. This new flame-tube is distinguished by the company appellation of "bullet-nose"; it has six circumferential rings of holes around the forward-facing flanges, but no film-cooling of the type employed by Rolls-Royce. There are nine in the complete engine, each mounted downstream of a single Duplex nozzle.

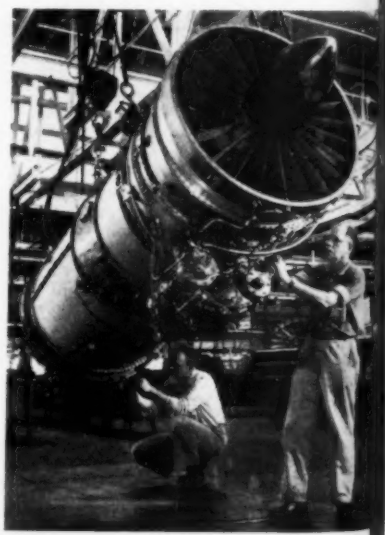
As might be expected, Pratt & Whitney have abandoned the elephant-ear lateral discharge nozzles for the fan air in favour of concentric discharge at the rear. This obviously facilitates noise-suppression and the fitting of a reverser, but it is noteworthy that the cutaway gives no indication of controlled mixing. Rolls-Royce had found the latter to be essential for the achievement of minimum specific consumption (see Spey drawing in May 18 issue). SNECMA, United Aircraft licensees in France, have designed a JT8D nacelle, with reverser and nozzle, suitable for the Boeing 727 and Caravelle 10.

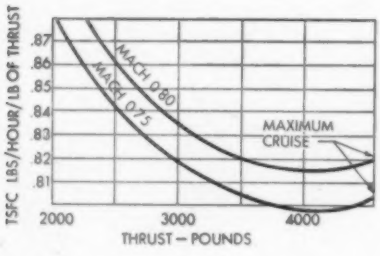
PRATT & WHITNEY JT8D-1

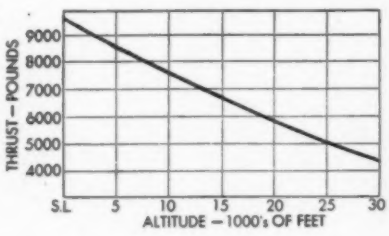
Twin-spool, front-fan engine, optimized for flight Mach numbers of the order of 0.9. Two-stage fan, four-stage low-pressure compressor, seven-stage high-pressure compressor, annular combustion chamber with nine flame-tubes, single-stage high-pressure turbine and three-stage low-pressure turbine. Inlet diameter 42.5in; maximum diameter (rear mounting flange) 44.8in; bare dry weight, 2,994lb (varies with installation); take-off rating, 14,000lb.

Development schedule: First drawings released to experimental fabrication, November 1960; first development engine run, April 1961 (more than 60hr had been logged on June 19); first flight in experimental test bed, October 1961; first prototype delivery, May 1962; first production delivery, February 1963.

Right, the first development JT8D-1 engine photographed in the plant before going to the test cell last month. Below, estimated performance curves for a standard day: 25,000ft cruise (left) and maximum continuous climb at 300kt







SPORT AND BUSINESS

Private View

BY P.P.O.

"The Royal Aero Club can only be as strong as its members"

IF you walk down Piccadilly on the north side coming from Hyde Park Corner, soon after you pass Apsley House—where, the history books tell us, the mob once broke the windows to signify their disapproval of the Duke of Wellington's attitude to the Reform Bill—you will see a short flight of stone steps with the number 119 on both sides of the doorway. You will be standing at the entrance to the Royal Aero Club, that august club formed sixty years ago to encourage sporting aviation in all its aspects. The group who formed it were balloonists—who, in those days, were the only aviators.

If you have a friend who is a member, get him to take you inside, because there you will see many interesting relics of the great days of sporting flying in this country—programmes of race meetings at Hendon, early pictures of Croydon, cups and trophies won by such names as Hamel, Sopwith, Grahame-White, Handley Page. You will also find a pleasant staff, good food, comfort and a lot of members, a few of whom are still interested in sporting flying and believe that private flying in this country has a future.

If you do not want to afford the rather heavy subscription which a present-day West End club has to charge to pay its expenses, you may instead become an associate, and be able to use London-

"... including the librarian, the irrepressible John Blake"

derry House (in Park Lane, just round the corner) and its excellent library. Here you will meet a lot of charming people, including the librarian, the irrepressible John Blake; and, if you dig a little into the delightful confusion, you will find all sorts of details about nice places to eat in Corsica, or jolly little aerodromes in Luxembourg.

The important thing, if you have just bought an aeroplane or just got your PPL, is to join whichever grade suits you. The Royal Aero Club can only be as strong as its members. There is a lot to do now, and there will be still more to do in the future. Don't be put off by the slight "we know it all, old boy" atmosphere you may encounter, nor by the numbers of members who have no very obvious interest in the sporting side of aviation. The Club just now is putting up a first-class fight to make the country a good place for the private pilot to fly in, and they need all the help and enthusiasm you can give them.

* * *

The Shackleton sales weekend at Coventry is now history, but its effects may well remain with us for a long time. Walking up and down the rows of new aircraft, I wondered whether in any place or at any time there had ever been a more representative or varied display of light aircraft, or of aircraft from as many different countries. The potential buyer of an aeroplane in this country has never had it so good—nor, I fancy, will he ever have it so good again. If you include the good selection of secondhand aircraft on display, it is true to say that you could buy an aeroplane in good flying condition for any price from £300 to £250,000, although many of the cheaper aircraft were anything up to 25 years old.

One of the charms of the aeroplane from the owner's point of view is that, provided you look after it and do not wrap it round a tree one afternoon, it does not deteriorate as most motor cars do. The sometimes irritating Certificate of Airworthiness, or Permit to Fly, which must be renewed annually, has the charm of guaranteeing to the owner or buyer that nothing is likely to go seriously wrong without his being aware of the possibility.

An aeroplane in its normal flying life does not undergo the stresses and strains which a motor car suffers, and there is not the dust, dirt, and grit in the air which you find on the road. It is always a joy to see a vintage motor car in first-class running order. There is no reason why the new aeroplane you may be thinking of buying today will not last you even longer if you look after it.

A lot of people these days are thinking of coming into the flying business. Some are already in, some are still teetering on the brink. Just now, if you go to the nearest flying club, ask to see the chief instructor, and announce that you want to learn to fly, he may very well be pleased to see you and may even invite you to take a trial lesson then and there. But you don't have to be a mathematician to work out what is likely to happen in a year or two's time, when the few who want now to learn to fly become the many. Flying clubs, new aeroplanes and instructors don't grow in the night.

In the 1930s, when private flying was beginning to become popular, it was nothing unusual to have to wait three or four months before you could get your name on a club waiting list, and flying lessons had to be booked to suit the instructors, not the learners. This will happen again for a certainty. Already the better-established flying clubs where really first-class instruction is given are pretty full up. There is a certain conflict of opinion, partly based on the depth of your purse, as to whether it is best to take your flying instruction in steady doses or all at once. A private licence involves about 30 hours' flying, some dual and some solo. An energetic person, given reasonable summer weather, could get through all this in about ten days. Spreading it to one or two periods a week, it could take you four or five months. My opinion is that it is better to err on the short rather than the long side, but that one thing is quite certain, and that is that if you wish to become a reliable pilot you must do some further dual with a good instructor after you have got your licence. Careless flying habits develop very easily. Most modern aeroplanes are tolerant and forgiving, but if you abuse them and the rules of good flying too much, sooner or later they will turn round and bite you.

There is a basic difference between flying and motoring—the aeroplane tends to exact a bigger forfeit for a smaller fault. Flying is certainly not more dangerous than motoring. It is far safer as a ratio of risk to miles travelled, and the other fool is not so common; but an aeroplane accident tends to be more expensive in material and repair bills than does a motor accident. The premium you may earn by taking the trouble to be an expert rather than an average performer is well worthwhile, and a few hours spent with a good instructor in your own aeroplane after you have got your licence can be a very good investment.

Getting the hang of it, of course, includes the use of radio and the various navigation aids that are beginning to be practical in small aeroplanes. It may also include instrument flying and night flying—all developments which will make the light aeroplane a nearly all-weathers vehicle like its big brother, the airliner.

But the pilot of a light aeroplane, if he or she wishes really to be able to use his mount to the fullest advantage, must know it all. He should be able to land his craft in a small field in a snowstorm, as well as do a ground-controlled approach into a busy airport. Inevitably, the quality of his instruments and the maintenance he can give them will not compare with those of an airliner, so just learn to be a good contact flier, or visual pilot, before you learn to lock yourself in the office and do it all with little dials. You will enjoy it much better that way.

FREE-FALL CHAMPIONSHIPS

BY JEREMY JOHNSTON
(of the British team)

I FEEL the rush of air, the peace, the exhilaration and thrill of free fall. I am falling through space in the stable spread-eagled position. Slowly adopting the "frog" position by bending my arms and curling my legs up behind me like a scorpion, I isolate the target 4,500ft below and turn quickly to face it by twisting my body to the right and moving my arms and legs. By dropping my arms close to my side in the "delta" position I now glide forward as well as rushing earthwards at over 200ft/sec. Glancing at my altimeter and stopwatch on my reserve (chest) parachute as I fall below 3,000ft, I re-stabilize in a swallow-dive attitude by arching my back and extending my arms and legs. I feel a sensation of lift due to deceleration. At 2,000ft I draw my arms in and snatch the ripcord. The day is Sunday, June 18, and the International Parachute Championships at Leutkirch have just finished.

Leutkirch is an unspoilt rural town in the Allgau district of Southern Bavaria. Three kilometres away is a private grass airstrip owned by Fürst (Duke) von Waldburg zu Zeil. Here, amid picturesque surroundings, an international parachute tournament is held every second year—alternating with the world championships (which next year will be in Orange, Massachusetts). Six West European countries—France, Italy, Austria, Switzerland, Germany and Britain—were represented, together with US Armed Forces, Europe. Belgium and Sweden were also invited, and the former sent one lone individual. The championships were an unreserved success: the Teutonic organization was masterful, goodwill and hospitality unbelievable, and the beer cold!

The aircraft used were new to our parachutists. There was a Sikorsky H-34 helicopter, supplied by the German Army and capable of carrying ten parachutists, which seemed tailor-made to represent the end-product of the perfect free-fall aircraft. The other aeroplanes used were three Piper Super Cubs by courtesy of the Burda Staffel Advertising and Publishing Co. These proved a bit of a struggle in exit. Both the "chopper" and the Pipers flew at 80kt when dropping parachutists.

We owe a grateful debt to the weather. For once, being far enough away from England, it was made to order. In fact I think every member of the British team, except possibly Dave Francombe, has sloughed his skin several times *à la réptile*.

Each country was represented by two teams, each of three parachutists. Class 1 was for holders of FAI A and B licences, and Class 2 for those with Cs and Ds. Each competitor had four championship descents: in Class 1 two immediate openings from both 500m and 800m with spot landings, while Class 2 did two jump and pulls from 800m and two free falls from 1,500m, also with spot landings.

The target was in the middle of a 50m radius circle, and four points were deducted for every metre away from the centre of the target. In the 500m and 800m jumps all points were forfeited if the delay exceeded 3 sec. In descents from 1,500m with a 15-20sec delay, a maximum of 200 points per jump was given. Fifty points were deducted for every second less than 15, and the parachutist scored zero if he delayed more than 20sec.

The maximum points awarded for style was 100. The parachutist must become and remain stable immediately after leaving the aircraft and must not turn through more than 360°, otherwise he would lose 100 points. He was allowed to turn towards the target and "track."

With Mike McArdle as team manager, the British team comprised David Francombe (RAF Abingdon), Douglas Peacock (RAF Abingdon), and Jeremy Johnston (SAS Skydivers and Ripcord

The British team at Leutkirch: from the left, Leslie Howe, Jeremy Johnston, Douglas Peacock, David Francombe, John Thirtle and James McLoughlin. The heading photograph shows the author in free fall from the H-34 helicopter during the international championships (note helping boot at lower right)

Club) in Class 1; and James McLoughlin (British Skydivers and RAF Abingdon), Leslie Howe (Ripcord Club) and John Thirtle (RAF Abingdon) in Class 2.

John Thirtle did extremely well. He was unlucky with his last descent where a misjudgment caused him to fall well short of the target. Before this he had been neck-and-neck with the leaders—Offermann, Chase and Helms. His 800m immediate-opening total was the second-highest score in Class 2. The author and Jim McLoughlin returned the two closest spot-landings of the championship with 68cm and 1m 09cm respectively. In the 800m jump-and-pull event the former achieved the best total score of 385.8 (out of a possible 400) of either Class 1 or 2. A sudden change in wind direction and strength while airborne on one 500m descent, however, caused him completely to fail to score, thus forfeiting the British chances of winning the individual Class 1 event (final place, third).

Every championship has its little drama, leaving the spectators thrilled and satisfied that they have had their pound of flesh. A German landed on a barn roof. The roof suffered substantially but fortunately the parachutist did not. The writer had an unfortunate accident in the aircraft. His pack came open and was re-closed in flight with the welcome help of Arvin Briscoe (USA). This resulted in the main canopy malfunctioning so he "flew" his reserve. Both these incidents must be kept in perspective, however; a total of several hundred descents was made without injury.

Most modern sporting parachutes are highly modified. By cutting out one or more panels to a greater or lesser degree, the parachutist is able to give the canopy a very much increased performance. This gives one the ability to turn quickly and drift forward at up to 12 m.p.h. in still air. The rate of descent will of course be increased, but not prohibitively so. The modified parachute is stable and does not oscillate.

In the British team Les Howe uses a triple-gore type to good effect. John Thirtle favours a double-T modification, David Francombe and Douglas Peacock double-Ls and double blank-gores, while Jim McLoughlin, Mike McArdle and I prefer a TU (or conquistador). However, the last-named must be handled like a thoroughbred because of its power. If a last-minute turn is too fast

Flower-like pattern against a summer sky: a 32ft plain-canopy "drifter" is used to assess wind conditions in the target area before championship drops begin

the parachutist will swing out in oscillation due to centrifugal force. If he lands at the wrong end of the swing he will lose valuable distance.

The French and the Germans used only single blank-gore canopies because of national laws barring further modification. This is a handicap—with a more powerful canopy one can cover up a multitude of mistakes. Nevertheless the French were very highly seeded and their performance, although good, fell a long way short of expectations.

Gamesmanship, in the British sense, unfortunately cannot be applied to international parachuting. There were protests from the French and applications for re-jumps, principally on the grounds of dissatisfaction with the H-34 helicopter. My own view is that I have never dropped from an aircraft so nearly fulfilling the perfect requirements. On the day after the championships the American team, a Belgian, Les Howe and myself set out to prove our confidence in the helicopter. We made three separate runs across, downwind and upwind from 500ft, and demonstrated the machine's versatility by all "bombing in" on target.

The Germans were relatively inexperienced, many of them using extraordinary-looking triangular canopies with only one small gore missing. It would be a wonderful parachute for troop-dropping as it has a phenomenally stable and low rate of descent; but its manœuvrability is sluggish and it is therefore useless for competition work. During the air display on the Sunday the Germans' three best parachutists achieved a delay of over one minute from a height of over 4,000m out of the Burda Staffel Pipers. This is, I believe, a German national record. It was just the tonic that they and their supporters needed. Three weaving white smoke-trails hurtling earthwards for over 60sec was indeed a gripping sight.

The unusual shape of the German triangular canopy, with single blank-gore, is evident in this picture

The Italians were a happy team of clowns, immaculately and identically dressed and with the most enviable new parachute assemblies. The Swiss were quiet and unassuming. The Austrian Class 1 team contained a very attractive young woman, Helga Sarsche, who was also a competent parachutist. She became everyone's darling on the last day by making a 20sec delay from 1,500m while holding hands with Peter Chase (USA)—quite an exciting tangle of arms, legs and feet.

I cannot do justice to the American standard, generosity and humour in just a few sentences. The results at least speak for themselves. They were a wonderful team and all amicable individuals with a wealth of parachuting repertoire and expressions. A pilot's initial instructions, for instance, might well be: "O.K. Mac, take her up till she smokes." They gave us advice of sound value on techniques for passing batons in free flight, doubles and trebles (i.e. two or three people holding hands in free fall) and general relative work. We are all raring to have a go at these more spectacular manœuvres.

There is a large discrepancy in standards between the American and the FAI parachutist licensing systems, which needs reviewing as soon as possible. Normally civilians are barred from flying in military aircraft. The German Army supplied the H-34 helicopter and so, before being cleared to parachute from the machine, we were all required to sign forms saying we would not claim in the event of injury or death. The USAF and Army condone a similar practice. How welcome it would be if the RAF and the Army Air Corps could be persuaded to do likewise.

TEAM RESULTS

Class 1 (Spot-landing only)

		points
(1)	USA	1,811.9
(2)	Austria	1,346.1
(3)	Italy	1,307.2
(4)	Switzerland	1,235.9
(5)	Britain	1,212.5
(6)	W. Germany	470.2

Class 2 (Spot-landing and free fall)

		points
(1)	USA	3,150.7
(2)	Austria	2,900.5
(3)	Switzerland	2,849.8
(4)	France	2,653.0
(5)	Britain	2,433.8
(6)	Italy	2,235.9
(7)	W. Germany	868.8

INDIVIDUAL RESULTS

Class 1: 1, Briscoe, USA, 665.7; 2, Passailaique, USA, 656.5; 3, Johnston, Britain, 542.1; with Peacock tenth and Francombe sixteenth.

Class 2: 1, Offermann, Switzerland, 1,112.4; 2, Chase, USA, 1,091.6; 3, Helms, USA, 1,087.5; with Thirtle seventh, Howe fourteenth, McArdle fifteenth and McLoughlin nineteenth.

"Bombing in" on target, using a TU modified canopy

SPORT AND BUSINESS...

Fly-in at Cranfield

A SPARKLING selection of current light aircraft flew in to the College of Aeronautics Aerodrome at Cranfield, Bedfordshire, on June 17 for the opening (reported last week) of the Bedfordshire Air Centre. They included British, American, French, German and Czechoslovak types. The new air centre is the brainchild of Mr Neville A. Rogers, whose company, W. H. and J. Rogers (Engineers) Ltd, is regional dealer for Cessna. The College authorities have co-operated in making available the aerodrome for the centre's seven-days-per-week operations, and maintenance of the centre's fleet—initially a Tiger Moth, an Auster and a Cessna 150—is carried out by the Flight Department of the College. The Principal of the College, Mr A. J. Murphy, and the Head of the Department of Flight, Wg Cdr Charles McClure, are vice-chairmen of the centre; and the centre's hon secretary, Mr A. J. McDonald, is a pilot on the College staff. Air centre manager and CFI is Mr R. D. Campbell, with Miss Pamela Klein and Mr McDonald also instructing. Hourly rates vary from £3 15s (Tiger Moth) to £5 5s (Cessna 150).

Above, visiting trio on the Cranfield flightline on June 17 comprised Piper Cherokee, Omnipol Meta-Sokol and Beagle-Auster Airedale. Right, Mr Peter Masefield declares the centre open, with Mr Neville Rogers at left

Below left, the Piper Cherokee (subject of a flight report in last week's issue) attracted much interest. Below right, references to shaggy dogs were the inevitable result of the appearance of the wool-tufted Airedale. Both types were duly demonstrated

BRITISH, French, Swiss, American and Czech pilots will compete in this year's British Lockheed International Aerobatic Trophy at Baginton on July 13-14. The entry list is as follows:

Britain. J. R. Ayers, Charles Boddington, Michael Popoff, N. G. Pocock.
France. Jean d'Hulst, Jean d'Orgeix, Marcel Charollais, G. J. M. Verette, Louis Delhomme.
Switzerland. Francis Liardon.
USA. Frank D. Price.
Czechoslovakia. Jiri Blaha, Jaromir Hulka, Ladislav Trebaticky, Jiri Stoklasa (reserve).

The British pilots will all fly Tiger Moth G-AOAA, Verette a Morane-Saulnier MS 350, the other French pilots Stampe SV.4s, and Liardon and Price will have Bucker Jungmeisters. The Czech pilots' aircraft have not yet been specified but are likely to be Zlin 226s or 326s. The preliminary round of the contest will be flown on Thursday, July 13, and the final on Friday, July 14, with displays by the winners included in the programme of the Coventry Air Pageant on Saturday, July 15. Also included in the Saturday programme is the King's Cup Race, the only race in this year's Coventry meeting.

AN INTER-SERVICES free-fall parachuting competition will be held during next weekend, July 1-2, at Hereford racecourse. Participating will be teams from 22 Special Air Service Regiment; Special Forces, US Army; and No 1 Parachute Training School, RAF. Organized by the 22 SAS Regiment, the contest will involve eight-man teams, with each man making three jumps with delays of 20-25 sec. On Saturday, July 1, teams from 22 SAS Regiment and Special Forces, US Army, will compete for the Whitbread Cup; on the Sunday the British Army group will compete against the RAF entry; and there will be in addition an individual competition on the latter day for which members of all three teams will be eligible. Any profits from the Hereford meeting will be given to the Airborne Forces Benevolent Fund.

A NEW CENTRE for private and business flying in Scotland has been established by Capital Services (Aero) Ltd at Renfrew. Hangarage, maintenance, hire and charter facilities and "every possible help to the aviator in or visiting Scotland" are being offered. Initially a day and night business charter service from Scotland to anywhere in the United Kingdom or the Continent is being provided together with a linking service for executive operators from Renfrew or East Fortune to all Scottish airfields. The company's address is 7 Rothesay Terrace, Edinburgh 3.

THE PROTOTYPE RG-1 ROHINI glider, designed and built in India from indigenous materials, has been demonstrated at the Delhi Flying Club. The new machine, a side-by-side two-seater, was designed by Mr S. Ramamithram.

FLIGHT SYSTEM SURVEY

American Autoflare Development

TRIALS of an autoflare system designed by the Autonetics division of North American are to begin in a Boeing 707 in September, according to information published in a Society of Automotive Engineers paper given in New York recently by R. K. Smyth and E. W. Velander of Autonetics. Successful flight tests have already been completed, using existing ILS, in an F-100F and TF-102 at several airfields in the USA.

Autonetics point out from the start that the British approach of providing duplication or triplication is expensive and heavy and they contend that a single-channel autoflare system, with optional manual or autopilot control and more primitive information as a stand-by, will prove adequate. The ability to make a blind landing either manually or automatically at will is considered an important adjunct.

Existing autopilots and flight director instruments can, say Autonetics, be modified with simple kits to accept the signals from the flare computer which consists basically of a radio altimeter whose signals are smoothed by an inertial rate of descent system (IRODS). Autopilot gains would be changed during autoflare. The back-up information, involving little or no computation, would consist of terrain clearance and rate of sink information displayed on a special meter and "a simple, weighted combination of altitude and altitude rate" fed to the steering dot on the flight director. The pilot could decide to overshoot or make a hard but safe landing using this basic information. A reasonable MTBF in the equipment should ensure correct operation after a test button had been pressed at the beginning of the approach to check the main equipment. An arbitrary gate at about 50ft would be set to allow the pilot to make a final decision. Heading guidance would be provided throughout by the ILS localizer and a light would tell the pilot to begin to kick off drift in proportion to the difference between aircraft heading and runway QDM, as shown on the course director.

The operation of the flare computer can be altered by the pilot, even when autopilot is engaged, by manual pressure on the control column, which is sensed by a transducer. Autonetics claim that their system behaves particularly well in gusty conditions and is insensitive to off-nominal initial conditions. Tests have shown that variations of plus or minus 50 per cent in sink rate at the initiation of autoflare produce variations in touch-down time of only 1.5sec, equivalent to a touch-down displacement of about 350ft.

Autonetics note that pilot opinion on automatic landings has been somewhat surprising and that pilots expect much better performance from the automatic controls than they are satisfied to produce manually themselves. They have stated that they would like the automatic flare-out to begin a little before it is actually necessary, so that a malfunction will become evident when there is still time to take over manually. They do not like the autoflare to cause ballooning, even in conditions when they would themselves flare-out in this way. Flight path angles should at no time become steeper than those normal when adhering to the glide-slope; and the sink rate should not decrease rapidly in the last few seconds of flare-out. Pilots like the automatic system to achieve a touch-down rate of descent of less than 2ft/sec.

If any of these criteria are violated by the autoflare system, the pilot would probably feel it necessary to take over manually, even though the automatic landing would have been successful. And yet pilots normally touch down closer to the glide-path origin than the automatic systems, thus apparently consistently violating their own standards. Autonetics feel that the glide-slope origin might well have to be moved closer to the runway threshold unless touch-down 2,000ft beyond the threshold was acceptable on a particular runway.

Military, airline and manufacturer interest is reported to be very encouraging and Autonetics say that development flying during the coming year should demonstrate the feasibility of their autoflare system. The equipment should be ready for operational use "in the near future."

Two 250-ton radio telescopes mounted on railway lines at Defford to form the new Royal Radar Establishment interferometer. They can be used either "actively" with transmissions or "passively" to locate the exact position of a radio source in space. A wide band of frequencies down to a few centimetres can be covered with the 82ft aerials. One application might be to differentiate between meteorites and oncoming ballistic missiles for defence purposes

DME Procedures Inaugurated

THE Federal Aviation Agency began using DME procedures on a nationwide basis on June 15 and has proposed that all civil aircraft weighing more than 12,500lb should be equipped with DME by January 1, 1964. Special approach procedures using DME have in fact been in use at certain airports for some months and considerable simplification of approach paths has been possible, but relatively few aircraft are as yet equipped. Now, the American Airlines jet fleet is fully fitted and other airlines are planning to follow suit in time to meet the proposed deadline of July 1, 1962, by which time all jet aircraft must be equipped. All turboprop aircraft will have to be fitted by July 1, 1963. The equipment schedule was proposed by FAA at a government-industry conference in Washington on March 22 and met with general agreement.

Of the 735 VORs now in commission, 259 are Vortacs (incorporating Tacan) and 17 have only the DMET element added. There will be a total of 60 VOR/DMEs, as an interim measure pending full conversion to Vortac. Some 43 more DME facilities are scheduled to come into operation by the end of this month. A Vortac beacon also provides full Tacan bearing and range service; and all front-line US military aircraft will be fitted with Tacan by the beginning of next month.

A track reporting centre with PPI consoles, height/range display and communications selectors in one of the underground "Rotor" defence radar stations in Britain. Information has recently been released for the first time on Marconi's work in designing these installations during the 1950s. Mobile centres code-named "Vast" were also produced and centres prepared for the RAF in Germany. Marconi have more recently designed defence installations for Sweden incorporating colour and black-and-white radar and capable of use in civil air traffic control. A very large NATO contract for radar was also won a few years ago

Constellation 0.49E G-AMUP in the livery of its new owners, Falcon Airways (see letter below from Mr Dennis Powell)

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Flight-deck Manpower

WITH reference to your news-item "TCA Pilots for BEA" (page 323, March 10): the facts given strengthen all convictions that pilots in general want the "sacred ground" of the flight deck entirely to themselves.

In the heavy four-engined aircraft of yesterday, the flight crew usually consisted of five—captain, first officer, navigation officer, radio officer and flight engineer, yet each of these last three specialists have now been replaced by pilots. First, the radio officer vanished when the modern, easily operated radio came into use; then, with the introduction of instrument navaids, navigators were dispensed with. Now, of course, pilots have become flight engineers, and in this day of highly complex aeroplanes the obvious question of "How can they?" arises.

It is interesting to find what qualifications the flight engineer has to possess prior to obtaining a flight licence. Usually a licensed aircraft engineer, he has completed a five-year apprenticeship in aircraft engineering, followed by perhaps three years in obtaining his airframe/engine licences. To become a flight engineer takes a further three months' training, making the time from start of apprenticeship to possession of a flight engineer's licence about eight-and-a-half years. Yet, in a short period of time a pilot is allowed to operate also as an engineer!

No one will claim that flying an aeroplane is an easy job. On the contrary, with higher speeds and an even more crowded airspace than before, it is a highly complex job, requiring the utmost concentration. Why then, not delegate the handling of engine, fuel, and electrical systems to an engineer, leaving the pilots to fly the aeroplane? Surely the years of training and experience of a specialist cannot be absorbed by the pilots without increasing mental fatigue during present-day operating schedules?

Of course, airline executives may say that having a flight engineer increases operating costs; or perhaps that there are not enough flight engineers available. Taking the cost angle first, would the expense of having a flight engineer be more than the pay increases which pilots are going to demand for acting as flight engineers anyway? Secondly, it would take perhaps twelve weeks to convert a licensed ground engineer to flight engineer, and there must be a good few personnel who would want to take this position on the flight deck.

No doubt pilots and airline executives can give many reasons why these views are at fault. But, who knows, perhaps we shall yet see pilots acting as ground maintenance engineers also!

Melbourne, Australia — DAVID R. D. POTTS

Falcon Airways' Constellations

NEWS that Falcon Airways were to buy three Lockheed 0.49E Constellations (L.49E in their early designation) was briefly reported in *Flight* for December 9 last. At that time the transaction depended on an import licence being approved by the Board of Trade. Happily this seems to have been granted without undue delay; the first of the trio (G-AMUP) went into service in March; the second (G-AHEL) is due to enter service as this letter is written. These 82-seaters are to be used on long-range charter flights, including inclusive circular-tours on a world-wide basis, the majority of which will originate from outside the United Kingdom. Falcon are to be congratulated on an excellent choice of a well-proven and much respected type. Like many other Connies in service throughout the world, these aircraft should have many more years of profitable operation ahead of them, and your readers may be interested in a brief history culled from my files.

G-AMUP (CN.2051) started its career as N.90921 *Flagship London*, American Overseas Airlines having purchased it new from the factory in mid-1946. In those days it was regularly seen at Hurn and later at Heathrow whilst operating on AOA's North Atlantic schedules. When AOA was absorbed into PanAm in 1951, it was re-named *Clipper Jupiter Rex* and continued to fly with PanAm until January 9, 1953, when it was sold to BOAC, becoming G-AMUP and again, of course, being re-named—this time as RMA *Boston*. It continued to operate on BOAC's North Atlantic schedules until the corporation decided to dispose of the whole of their seven L.49s to Capital Airlines in "part exchange" for the same number of Capital's L.749s. G-AMUP left London Airport for the last time in BOAC colours on March 28, 1955, becoming N.2738A on the US Civil Register.

All seven ex-BOAC L.49s, including the former RMA *Boston*, were extensively overhauled and given greatly modified cabin furnishings, etc. The seating configurations varied according to the domestic flights on which these aircraft were employed with Capital. From mid-1958 onwards Capital's fleet of twelve L.49s were progressively withdrawn and at least six were put into storage. The prolonged negotiations which finally led to Capital being absorbed by United Airlines are now a matter of history. Finally, as a result of Falcon's negotiations, N.2738A was ferried from New York to London Airport on January 7 this year. It was then restored to the UK civil register, reverting to G-AMUP in accordance with normal ARB practice. In its 14 years of service this Connie has already logged 30,632 airframe hours, which works out at an average of over 1,900 hours per annum.

G-AHEL (CN.1977) was the sixteenth L.49 off the Burbank production lines, actually an original C-69 airframe modified to full civilian standards (in this case to BOAC's own specifications). It was ferried from Burbank to London on May 12, 1946, and within a week or so went into service on the corporation's North Atlantic route as RMA *Bangor II* (following the withdrawal of BOAC's famous old Boeing 314s, one of which was the original *Bangor*, G-AGCB).

I remember *Bangor II* with some personal affection, having flown in it on four occasions in 1948-50 whilst a member of BOAC's traffic staff, based at Prestwick. The aircraft went to Capital on January 27, 1955, becoming N.2736A on the US register, and arrived back in the UK (upon sale to Falcon) in February this year. In its 14 years of service it has logged 30,186 airframe hours.

G-AHEJ had the distinction of being the very first L.49 to be delivered to BOAC: appropriately named *Bristol II*, it was delivered to the corporation's Montreal Engineering Base on April 26, 1946. Built as a C-69 airframe, it was actually allocated the USAAF Serial 42-94554 and was the fourteenth aircraft off the original C-69 Burbank production line. During nine years' continuous service with BOAC it remained (like the five original sister-aircraft delivered to the corporation) on the North Atlantic route.

Bristol II (actually the "II" was later discarded from all three aircraft names, so that they became simply *Bristol*, *Bangor* and *Berwick*) went to Capital on May 27, 1955, becoming N.2740A and remaining in that airline's service until early in 1959, when it was withdrawn from service and put into storage at Washington DC (National) Airport until finally sold to Falcon. It was ferried from Idlewild to London Airport in March this year. G-AHEJ's total airframe hours to date are 31,974.

I understand that, prior to their delivery to Falcon, all three aircraft were extensively overhauled, though whether this was done in America or the UK I have been unable to verify.

Nairobi, East Africa — DENNIS POWELL

Cinematic Conversions

RECENTLY, I paid a visit to my local cinema, where the latest motion picture on a mishap in the air was showing. The title was *Jet over the Atlantic*. The story was, as usual, about the aircraft being brought down safely by the hero after the pilot comes to grief.

The landing was really spot-on, and this wasn't bad by a chap who had never flown a Britannia before. The story was good; the acting fairly good; but the aircraft sequences were atrocious. On the tarmac, the aircraft was a Britannia. On take-off, it rapidly changed to a Stratocruiser and in the air changed back to a Britannia, but now with BOAC markings. On landing in the USA, it looked very much like a Viscount landing at London Airport.

When will these motion picture directors get their data correct? It does so spoil a good film.

London SW6 — R. C. WILLIAMSON

CORRESPONDENCE IN BRIEF

Bjorn Jonansson, who is 10 and interested in aviation and cars, writes from Finland to say he would like to correspond with an English boy of similar age and interests. His address is Borga, Kaptensgaten 8, Finland.

G. L. Hope, who is 14, writes to say that he is interested in aircraft, is thinking of starting a club with some friends, and wonders if any readers could spare brochures, timetables, photographs or other aviation literature. His address is 107 Benhurst Avenue, Elm Park, Hornchurch, Essex.

Straight and Level

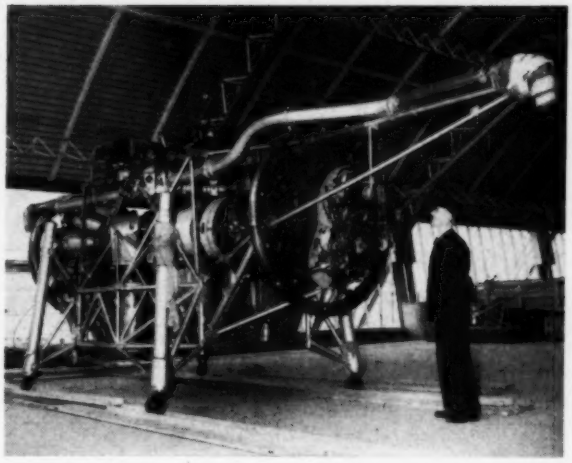
THE other day BBC Television interviewed Dr Richard Beeching of British Railways. The interview was wide-ranging enough for discussion of all sorts of railway problems, including road competition. But there was no mention of air competition, and the effect that this will have and is already having on British Railways' high revenue trunk route services.

If only somebody in British Railways would just say that they are *aware* of the very real possibility that, as has happened in the USA, mounting air competition may eventually kill the railways' long-haul passenger business.

It worried me last year that a Parliamentary select committee could expend goodness knows how many words and hours investigating the future of British Railways, into which hundreds of millions of pounds of taxpayers' money is being poured, without looking into the effects of air competition. It is just as worrying that nobody in British Railways seems to know what their traffic is on trunk routes such as those from London to Manchester, Edinburgh, Glasgow and Belfast. The only railwayman who seems to be awake is the Editor of *Trains Illustrated*, who in his June issue has an article called "In the Shadow of the Vanguard." In it he offers some very uncomplacent thoughts about the menace of air competition.

British Railways can't beat the air, so they ought to join it. I look forward to hearing that they are thinking along these lines.

● At the Pathfinder Association dinner Arnold Field, who is Master of the Guild of Air Traffic Control Officers, told a colleague that when an aircraft called London Approach the service given was the same whether the recipient was a Boeing 707 or *Flight's* Gemini. The same colleague had an opportunity of putting this to the test on June 18, when in a hurry to get from Fair Oaks to Elstree before the airfield was closed to visiting aircraft during the display there. He called London Approach on 119.2 after getting airborne on a westerly heading, to ask for VMC clearance. After telling him to stand by for a few moments they asked him to steer 090 and to reduce height to 1,000ft. After a few minutes of this heading he was given 050 to steer, which took him up towards the southern boundary of LAP. He was then vectored on to 030, told when he was two miles east of Northolt ("which has no traffic at the moment"), then informed he was on a heading for Elstree. As a result, the trip took him only 20min instead of half an hour more round the zone. Thanks, London Approach.



"And now, ladies and gentlemen, we come to the Derbysaurus, or, more correctly, Ouselum. Generically named after the River Ouse, and a habitant of the area bounded by the Tyne, Conway and Spey, it differs from the Lesser American Tailsitter in being, both in appearance and in natural aptitude, a bed-sitter. Its offspring, as you will be aware, ladies and gentlemen, move in ever-increasing circles, eventually disappearing vertically into their flight envelopes"

● Aeronautically, the name of Hodgson is primarily connected with the Hodgson-Cuthbertson collection (of what I suppose the bibliophiles and collectors know as *aeronauticana*) in the keeping of the Royal Aeronautical Society. It is further associated with one of the most scholarly and finely produced of all books on aviation—*The History of Aeronautics in Great Britain* by J. E. Hodgson, published in a limited edition of 1,000 copies in 1924 and today a coveted collectors' item. Yet another association with flying—and I am still speaking of the same family—is with C. R. ("Blick") Hodgson of our own publishing house and who is in the air with *Flight's* Gemini whenever he can get his hands on it.

But the same family has long been better known still in the rare-book world, in connection with Hodgson & Co, "Auctioneers of Libraries and Rare Books, MSS., Autographs and Engravings." The first four volumes of *Flight* went under the hammer at their Chancery Lane salerooms recently and realized £34.

I find that the individual issues would have cost a contemporary reader 19s 2d—in steady pennies and three-halfpences. What offers for an autographed copy of the first edition of Straight and Level?

● Did you notice how cunningly the Top Security Chiefs threw secret agents off the scent by tampering with the drawing of an integrated anti-icing and boundary-layer control system of a Certain Aircraft on page 852 of *Flight* last week? Alas, the treacherous dog who wrote the caption came near to wrecking their master plan by blabbing that the system was apparently that used on the Buccaneer. (Message for MI5: I saw the Soviet assistant air attaché in the technical editor's office the other day.)

● "*We shall be late arriving at London Airport because we were late leaving Orly.*"

Quote from BEA captain in his hello-to-passengers message on a recent Paris (Orly) - London flight.

ROGER BACON

"It doesn't matter where I am, or what I'm wearing, I do like my nails to look nice." (Astronaut Cdr Alan Shepard undergoing survival training some months ago)

ROUND THE STICKS

IN the racing mid-season, with Cardiff and Bristol events flown and the Kings Cup Race at Baginton ahead, we present here "Flight" photographs which convey the racing mood and capture the exhilarating feeling of a tight pylon turn. The aircraft comprise the familiar Gemini, the sprightly Turbulent, the rejuvenated Archbishop Tiger, the anglicized Emeraude known as the Linnet, and the first foreign type to be entered for the Kings Cup Race—the Cessna 175. The entry list for this year's Kings Cup Race, to be flown on July 15, is made up of the seven pilots in each of three classes who obtained highest marks in the London - Cardiff race and the short-circuit class races at Rhoose. Leader on points at present in the British Air Racing Championship is Capt G. P. Watson (Proctor 3) with 64 points; the final champion will be determined after the Kings Cup results have been taken into account.

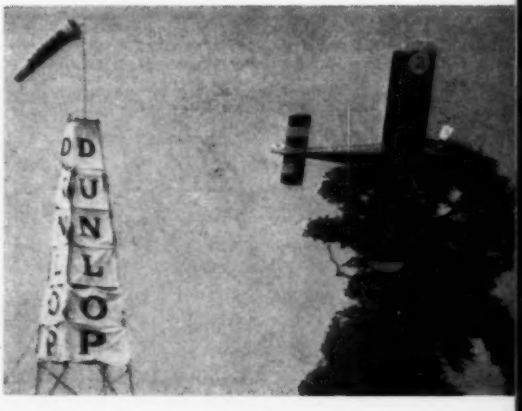
Cessna 175A

Miles Gemini I

Garland Linnet and "Archbishop" Tiger Moth

Rollason Turbulent

Rollason Turbulent



Wrights to Dyna-Soar

GOODYEAR'S HALF-CENTURY OF AIDING AVIATION SAFETY

GOODYEAR have been in aviation since the Wright brothers, for the Burgess-Wright biplane of 1911 had Goodyear tyres, shock absorbers and wing fabric. In the previous year the company had made the world's first pneumatic tyres for aircraft. Now, half a century later, the wheel of progress seems to have come full circle. Goodyear are making "thermal" tyres for the Bristol T.188 all-steel research aircraft and wire-tyred wheels—without rubber, without fabric, non-inflatory—for the Dyna-Soar re-entry project.

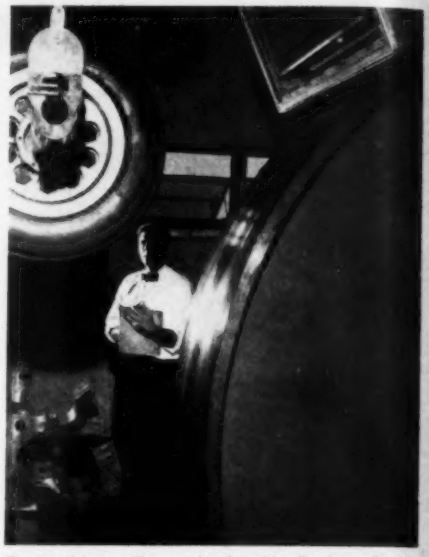
There, in a nutshell, is the Goodyear aviation story to date; but the history of fifty years' development is, of course, a good deal more complicated and interesting than the bare facts imply. It comprehends not only tyres but wheels and brakes, helicopter rotor brakes, anti-skid systems, erosion-resistant cements for radomes, jointing compounds—and from fuel cells to complete aircraft, airships and inflatoplanes. Its locale is not only the United States and Great Britain—the Aviation Division of Goodyear - Gt Britain has been established since the Second World War—but world-wide. The winged-foot insignia of Goodyear has become a universally known trade-mark from Wolverhampton to Woomera.

To get things into perspective it is worth taking a brief look at the beginnings of Goodyear as far back as that spring day in 1893 when Charles Goodyear discovered the principle of vulcanization. In tribute to this event, Goodyear adopted the discoverer's name when the organization was established in 1898. The company's first association with aircraft came before the 1914-18 war with the Wing aeroplane tyre and the manufacture of wing fabric; then during hostilities Goodyear started to develop self-sealing fuel tanks.

In the inter-war years they went in for lighter-than-air craft, building those famous American airships *Akron* and *Shenandoah*. (This came about through experience gained during the war, then through post-war American acquisition of Zeppelin patents.) But it was during the Second World War that Goodyear gained aviation experience in a really big way when they built over 4,000 Chance Vought Corsairs and more than 150 blimps, besides contributing parts to hundreds of other aircraft and producing nearly 90 per cent of the wheels and brakes for US fighters and bombers.

Because there was so much interchange of equipment owing to US-UK lease-lend arrangements, it became necessary for the Wolverhampton factory to get involved in the servicing of Goodyear equipment brought into this country. As a result of this, the Goodyear Aviation Division in Great Britain was set up. Further, since Goodyear then had the bulk of experience in producing giant tyres for earth-moving equipment, it was fairly easy for the company to switch to large tyres for heavy bombers.

With the post-war expansion of Goodyear aviation business, a wheel and brake factory was opened independently of the tyre factory at Wolverhampton, the company being offered by the Government a factory site either in North Wales or on Merseyside. They became established at Wallasey, remaining there until the latter half of 1958; and there, under NATO contracts, their production included thousands of wheel and brake assemblies for F-84s and F-86s. Another side of their aviation interest was the institution

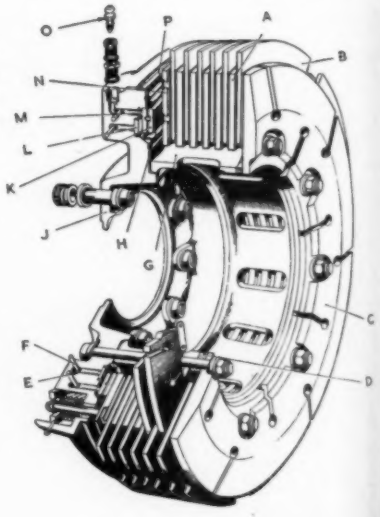


Testing "thermal" tyres developed by Goodyear for the Bristol T.188 all-steel research aircraft

Blowlamp test on the all-wire tyre developed by Goodyear for the Dyna-Soar project and designed to withstand temperatures of up to 2,000°F

A tyre being tested to destruction at the Goodyear test plant at Akron, Ohio, where contact speeds of up to 510 m.p.h. have been achieved

Vanguards of Trans-Canada Air Lines are being supplied with Goodyear Tri-metallic disc brakes. Details:



A Stationary disc
B Rotating disc
C Backplate
D Torque-tube spacer
E Back-up ring
F O-ring
G Torque tube
H Seal
J Housing
K Insulator
L Emergency piston
M Piston
N Pressure plate
O Bleed valve
P Retaining ring

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What are the qualities that a buyer looks for in a light executive/touring aeroplane ? Reliability, comfort, economy, performance, good looks ? And in what order ?

Whichever way you look at the new BEAGLE AIREDALE it scores well. It is comfortable, quiet and has good furnishings; it has a rugged airframe and a dependable engine. It has all-weather equipment for day and night flying. It is inexpensive to buy and it is attractively cheap to operate. It has a vivid performance with outstanding range capability. And it is elegant. **The AIREDALE is good business—and it is British.**

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A WORLD OF VIBRATION

Vibration technology is a comparatively new development in the field of environmental engineering. Its applications in measuring metallurgical stresses and strains, in simulating fatigue to destruction point, are fairly well-known, but even the present scope is far wider than these. The potential is immense to a degree which possibly outreaches that of any other applied science. It is even possible that there is much to be rediscovered, for the histories and mythologies of ancient civilizations abound in references to physical motion achieved through sound vibrations. The destruction of the walls of Jericho is an example; and it has been suggested that the Pyramids' vast masonry was elevated by similar means. But fascinating and perhaps revealing as that line of inquiry may be, this report will deal principally with the immediately practical uses of vibration testing.

From eyes to motor cars is an apt and related part of the applications range. Taking the first and uncomfortably picturesque example, an incidence of severe headaches and impaired vision suffered by transport drivers led to tests with vibration equipment. These showed that through vibration on certain road surfaces, the drivers' eyes were being literally bounced back and forth in their sockets.

MOTOR VEHICLE INDUSTRY

Car bodies and their attachments are subject to mechanical and other vibrations transmitted through suspension systems. What with wear and tear and varying concern for maintenance, the noises which can result are an age-old problem at the service station. The drumming heard by the owner 'under the back seat somewhere' is usually non-existent in normal workshop testing; out on the road it's audible but locating it is a tedious and uneconomic guessing game.

Yet further complications arise out of the fact that the vibration source may be far removed from the apparently offending component or structure.

We have a compact generator/oscillator/power amplifier combination by which all the running vibrations can be simulated *in the workshop* and the noise source accurately and quickly located. Similar equipment is used by car manufacturers so that vibrations can be compensated or designed out.

ROAD CONSTRUCTION

Roads, too, can be investigated with vibration equipment. An applied vibration is picked up at a distance, on an oscilloscope. The signal time and strength factors vary according to the nature and thickness of the surface and subgrade materials. By these readings it can be determined whether or not the construction is according to specification. Periodic tests will reveal the extent of any deterioration. In research, the behaviour of roads under various traffic conditions can be established and the information used in framing specifications for new roadworks.

AIRCRAFT INDUSTRY

In the aircraft industry, vibration testing has long been a vitally important technique. Bearing in mind the possible outcome of the failure of quite small components, vibration problems in land vehicles and structures pale into comparative insignificance. Goodmans equipment is widely used to test dynamic models . . . even whole aircraft . . . and on the multiplicity of instruments and electronic apparatus.

The tremendous power and complexity of rocket-propelled vehicles set still more-exacting requirements and for these Goodmans are producing special generators.

OTHER APPLICATIONS

The miscellany of these is far too extensive to catalogue here, but the following will serve to demonstrate the scope.

In fatigue testing, vibration generators provide wide range and prolonged consistency.

Chemical and bio-chemical research are served by our smallest generator, the V47, in mixing, emulsifying and the measurement of interface potentials. It has been used also to simulate nerve signals and to assess vibration effect on living tissue. Experiments show that physical vibration and 'white noise' have anaesthetic properties.

Vibration equipment is used in the rubber, plastic and textile industries, as an aid in establishing the materials' mechanical properties.

Experiments in the machine tool industry have shown that small and carefully controlled vibrations can, in fact, improve stock removal, surface finish and minimize the effect of certain operations upon molecular structure.

This is inherently a world of movement. Everything vibrates within itself and often as an entity. These forces can be observed, reproduced, supplemented. There must therefore be many functions for our vibration equipment which even we can only guess at . . . and even more as yet unthought of. Name your problem; consider what may be done better, faster, more economically . . . what may be done perhaps for the first time, with the help of vibration equipment. It's more than likely that the means to the end is ready-made.

Goodmans electro-mechanical vibration generators, the largest range in Europe, comprise:

TYPE	PEAK THRUST
V47	2 lb
390A	17 lb
790	35 lb
8/600 Mk.II	300 lb
VG108 Mk.II	5,300 lb
VG109 Mk.III	18,000 lb

There is available a corresponding range of oscillators and power amplifiers

GOODMANS
the vibration specialists

GOODMANS INDUSTRIES LTD. AXIOM WORKS, WEMBLEY, MIDDLESEX ENGLAND Wembley 1200 (8 lines) Cables: Goodaxiom, Wembley, England

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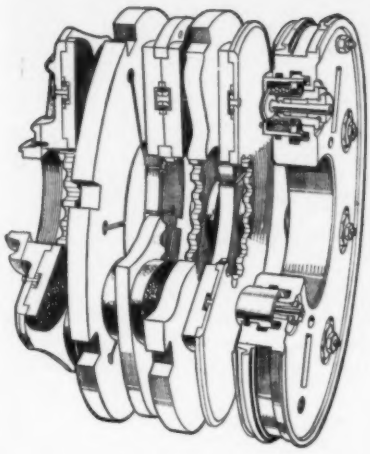
GD659



A Goodyear contribution to the Blackburn Buccaneer: a double disc brake. The company also supply an anti-skid system for this Naval strike aircraft

Right, Goodyear service at London Airport: the maintenance depot which was opened in 1952

Wrights to Dyna-Soar . . .

in 1949 of the Goodyear Trophy race to encourage private and club flying in the UK.

As a result of the Defence White Paper of 1959 with its effect of cutting-back aircraft orders, the design and development sections of the aviation division were re-located at Wolverhampton, and Electro-Hydraulics Ltd assumed responsibility for sub-contract production of Goodyear wheel, brake and associated equipment and became entirely responsible for design and production of hydraulic brake-control systems. Since the opening of the Goodyear depot at London Airport in 1952, and re-dispersal of some test equipment to LAP and Wolverhampton, the company have not suffered in the long run from this apparent contraction. The London Airport depot is primarily responsible for a round-the-clock tyre, wheel and brake overhaul service and it is there that a 24-hour tyre remould exchange plan was first instituted in the UK.

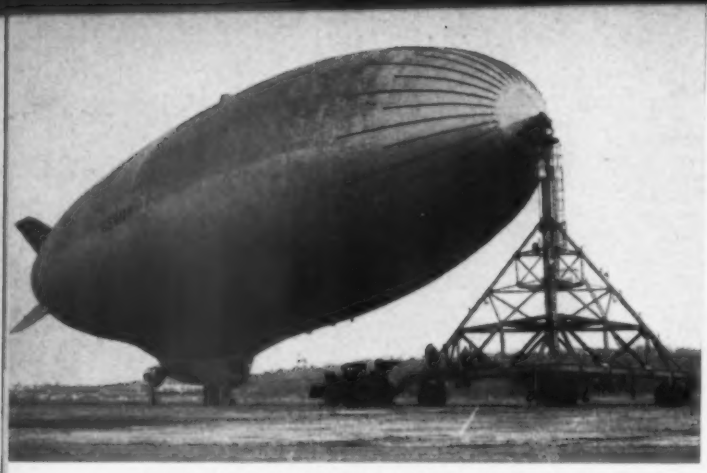
About 70 per cent of Goodyear's wheel and brake production goes for export to the Continent, only 30 per cent finding its way to the British market. Some of the British aircraft fitted with Goodyear wheels and brakes are the Blackburn Buccaneer, Handley Page Herald, the 23 Vickers Vanguards ordered by Trans-Canada Air Lines, a proportion of Vickers Viscount 700 and 800 Series aircraft, Bristol T.188, Beagle-Auster Airedale, Auster AOP Mk 9 and Agricola and Scottish Aviation Pioneer. Goodyear anti-skid systems are used where applicable.

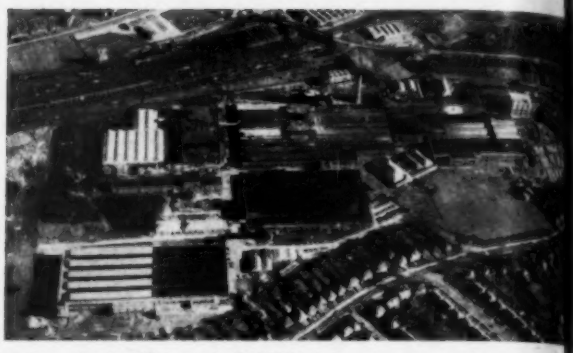
It has always been the company's practice to house their anti-skid sensing units within the undercarriage axles, the units being driven by the wheel hub caps. The only exception to this procedure has been on the Blackburn Buccaneer, for which the Goodyear fully electrical anti-skid system has been adopted. In this case, the fork undercarriage precludes an internal axle mounting of the sensing units and the alternative of an external friction drive has been adopted. Three Goodyear anti-skid systems are marketed—fully electrical, electro-mechanical and skid warning. The latter is more often known as the "foot thumper," the pilot being warned of an incipient skid by a vibration on the soles of his feet, encouraging him to release a little load from the foot brake pedals.

All types save one of the aircraft tyres produced by Goodyear are now of nylon construction; and the Wolverhampton factory has unique facilities for calendering the nylon fabric, facilitating

The company flag flying at one of the Goodyear Trophy races, which were instituted in 1949 to encourage sporting aviation in the United Kingdom

Left, Goodyear as aeroplane manufacturer: the Inflatoplane, developed for flying from unprepared surroundings, being flown over Wingfoot Lake by one of the company's test pilots. Below, wood-block test of special low-pressure tyres developed by the company for use over rough ground





Goodyear in America have been building airships for 50 years. Here is one of their latest for the US Navy, the ZPG-3W, designed to carry early-warning radar; a big aerial is contained within the envelope. (Right) Goodyear's Wolverhampton, Staffs, factory, where aircraft equipment is produced

Wrights to Dyna-Soar . . .

the 3-T (time, temperature, tension) entire carcase construction. All aircraft tyres returning to the Wolverhampton factory for remoulding are subjected to X-ray inspection as an aid to ensuring optimum quality in remoulded carcases.

Other aviation products from the Wolverhampton factory are erosion-resistant coating systems for radomes and the Bristol/Goodyear jointing compound used during assembly of the majority of British-produced aero-engines. The name of this compound is derived from the fact that it was originally produced by Goodyear to meet a Bristol specification.

If Goodyear achievements are looked at in more detail, it becomes clear that they have contributed very largely to that vital sector of aircraft operation—the business of getting safely off and on to the ground, made more hazardous by increased speeds and weights. (One tends to think of landing as the greater risk but Goodyear engineers will tell you that take-off imposes more of a strain on tyres.)

Look at tyres themselves first. Continuous strengthening plus more rigorous quality control at all points of manufacture have been the order of the day. The 3-T process gives greater strength in the carcase, the structural part of the tyre. When a tyre has been in service it can be examined by X-ray to see if it is fit for remoulding. Tyres used on Comets and Boeing 707s, for example, can be remoulded up to four times if their carcase is found suitable. The company have pioneered the development of high-speed aircraft tyres and their test facilities for this development are at present unique. Resulting from this facility is the range of "squat" Type VIII tyres, examples of which are those for the Bristol 188.

Closely associated with tyres are wheels and brakes, and Goodyear—as pioneers of disc brakes back in the 1930s—can claim as much know-how in this field as they can with tyres; in fact, disc brakes are the only type of brake they have ever produced for aircraft. An interesting installation is the single-disc wheel and brake conversion for the Bristol Freighter, which has resulted in reduction of brake maintenance costs from 15s 6d to 3s 6d per landing, in the experience of some operators. This is an example of this company's constant endeavour to produce brakes for long service life and low operating costs.

Tyres, brakes . . . anti-skid systems. Here is another field of Goodyear activity. For many years, the company have been claiming the advantages of an electrical as against a mechanical system for an anti-skid unit. A good example of an electrical anti-skid installation by Goodyear is that fitted to Viscounts of Continental Air Lines. All components of the system have an overhaul life of 3,000 flying hours, and it is hoped that in the very near future this will be extended to 5,000 flying hours. TCA Vanguards are fitted with the electro-mechanical anti-skid system. A more advanced anti-skid system—in which brake pressure is monitored by the tyre to ground coefficient of friction at any given time—has now reached the initial flight test stage.

One of the latest developments is a corrosion-proof aircraft wheel with titanium as its principal element, able to withstand temperatures of more than 1,000°F. Alongside this is the development of tyres to withstand high temperatures for long periods.

Goodyear employ some 6,000 people in Gt Britain. As a world-wide organization, their developments in the aviation field extend to a project for a self-inflatable space station, not to speak of the great blimps like the ZPG-3W being built in the US for airborne early-warning duties. The Convair B-58 Hustler is equipped with Goodyear wheels, Tri-metallic brakes and anti-skid equipment. This is a far cry from the Wing aeroplane tyres of 1911. But it shows how far Goodyear have progressed with, and in aid of, aviation during half a century of varied achievements.

HP APPRENTICE SCHOOL

INTRODUCTION of a new apprentice school by Handley Page Ltd was announced by the chairman and managing director, Sir Frederick Handley Page, at the Handley Page (Reading) annual apprentice prizegiving recently. He stressed the importance of technical training in this technical age. Plans had been made for the company to accept even more apprentices; but Sir Frederick warned that, due to the increase in the numbers of school leavers, there would be greater competition for places.

Sir Frederick added that the enlightened policy of the Handley Page Group with regard to apprenticeships recently had "the nicest kind of recognition," when John McIlwraith, an apprentice at the Cricklewood factory, became a finalist in the British Junior Chambers of Commerce Apprentice of the Year Award.

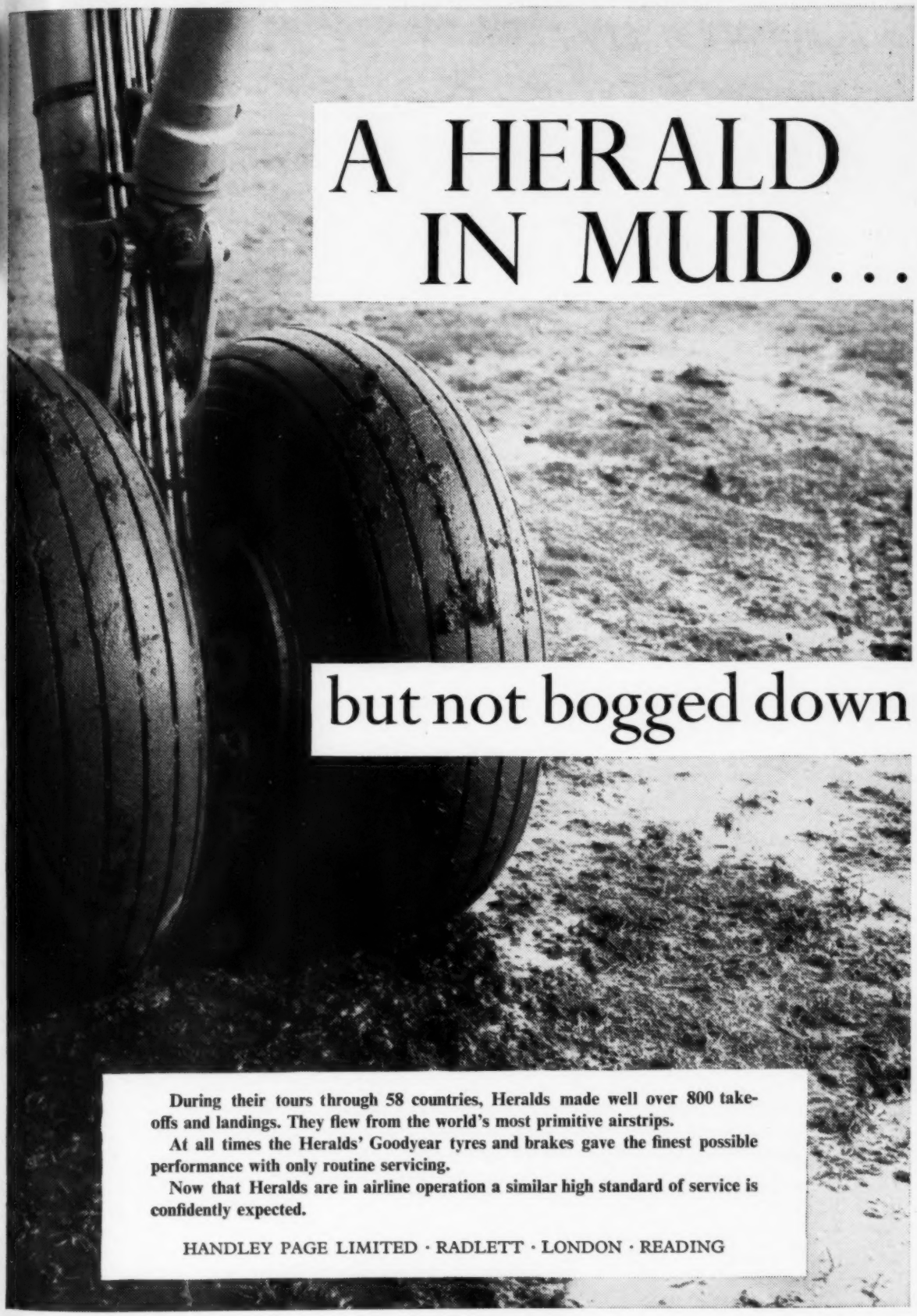
INTERAVIA'S ABC

THIS year's Interavia ABC—the ninth edition*—covers the re-organization of the British aircraft industry, revisions bringing this useful reference book up to date with the new groupings. In two other respects it accurately reflects trends and changes, detailing new US sales organizations for electronic equipment and accessories in the Common Market area, and commercial aviation organization in the new African states. For the statistically minded, this edition contains 500,000 lines of information, 36,000 names and 25,000 listings.

**Interavia ABC 1961—World Directory of Aviation and Astronautics. 1,325 pages, cloth bound. £4 net.*

FORTHCOMING EVENTS

June	30-July 3	Palermo Aero Club: 13th Aerial Tour of Sicily.
July	1-2	RAeC: Invitation Rally, Deauville.
July	6-8	Italian Aero Club: International Aviation Contest, Rome-Turin.
July	8	RN Air Station Abbotsinch: At Home.
July	8-9	Vittel Aero Club: Doctor-Pilots' Rally.
July	9-10	Turin Rally.
July	10-16	Aslib Aeronautical Group: Annual Conference.
July	12-19	University of Southampton/AGARD: Seminar on Astronautics.
July	13-15	RAeC: Lockheed International Aerobatic Competition and King's Cup Air Race, Baginton.
July	14-15	Marseilles-Provence Aero Club: Rally, Mejane.
July	14-16	Aerial Tour of the Pyrenees.
July	14-23	Angers Gliding Week.
July	15	RN Air Station Culdrose: At Home.
July	15	RN Air Station Brawdy: At Home.
July	15-16	Pescara Rally.
July	22	RN Air Station Lossiemouth: At Home.
July	22-23	Basse-Normandie Aero Club: 13th International Rally, Flers.
July	25-26	Portuguese-Spanish Rally.
July	27-29	International Business and Touring Aircraft Competition, Kidlington.
July	30-Aug 7	Derbyshire and Lancashire Gliding Club: Northern Gliding Contest.
Aug	1-13	Italian Gliding Championships.
Aug	27	Forli Rally.
Aug	27-Sept 3	Swedish Parachute Club: International Contest, Uppsala.
Aug	29-Sept 2	International Light-aircraft Exhibition, Luton Airport.
Sept	3	Wolverhampton Aero Club: At Home.
Sept	**4-10**	**SBAC Exhibition and Flying Display, Farnborough.**
Sept	6-10	FAI: European Air Tour.
Sept	8-10	Popular Flying Association: Rally, Cranfield.



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SUMMARY OF RESULTS AND POINTS OF INTEREST 1960

(In approximate figures)

GROUP SALES			**£20,000,000**
PROFIT BEFORE TAX			**£1,776,000**
(being 8.9% on Sales and 15.5% on Net Tangible Assets)			
of which Taxation took ...	46%		**£817,000**
Preference Dividends ...	3%		**£49,000**
Ordinary Dividends ...	24%		**£433,000**
Retained in Business ...	27%		**£477,000**
CASH FLOW (Retained Profits plus Depreciation)			**£970,000**
FIXED ASSETS ACQUIRED			**£899,000**
DEPRECIATION			**£493,000**
Earnings before tax per 5s. Ordinary Share ...			1s. 4¼d.
Number of Shareholders			14,000
Number of Employees in United Kingdom ...			nearly 12,000
Total Factory Floor Area in United Kingdom			1,600,000 sq. ft

There are over 60 operating Companies and Divisions in the Group.

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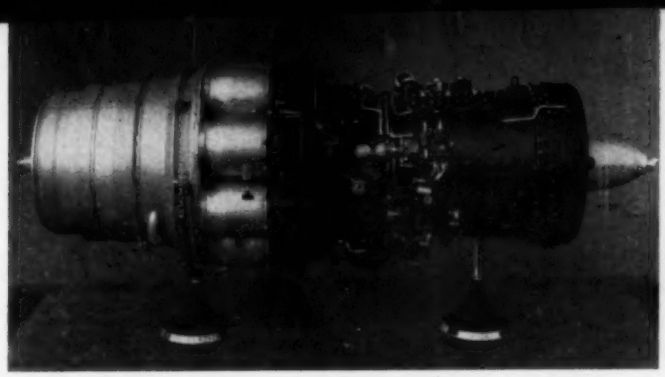


Two examples of model work by Shawcraft (see news-item below): an Armstrong Whitworth Siskin and an early mark of Rolls-Royce Avon

THE INDUSTRY

MODELS FOR INDUSTRY

SINCE the article "Scale-model Artistry" appeared (*Flight*, April 27) we have learned something of the work of another firm in the specialist aircraft-model field, Shawcraft (Models) Ltd, of 69 Rockingham Road, Uxbridge, Middx.

Formed in 1948, the company concentrated initially on the production of model aircraft, both "solid" and sectioned, for advertising, display and exhibition work. Soon it began to expand rapidly, film contracts playing a large part. One such order was responsible for Shawcraft's largest model—a full-size replica of the Vickers Vimy of transatlantic fame. With a wing span of 67ft, the model closely followed the original in material and structure and was powered with two Ford V.8 engines driving 10ft 6in propellers—a requirement being that the aircraft should be capable of taxying under its own power at up to 25 m.p.h.

At the other end of the scale, models have been built with spans of only a couple of inches. One example was a BOAC Argonaut of 2¼in span, with a working electrical system for cabin, landing and navigation lights. It was used in a scale model of London Airport which included approach, runway and general lighting.

Early in their history Shawcraft began to experiment with glass-fibre and other plastics for model aircraft construction, their first complete glass-fibre model being a 6ft-span de Havilland Mosquito built some seven years ago, again for film work. Since then glass-fibre has played an increasing part in their production programme, and the traditional hand-carved wooden model is now largely reserved for one-off models, mock-ups and comparable items. Now the company's glass-fibre department has developed into a self-contained unit, producing many items far removed from aircraft model-making.

Shawcraft also make components for actual aircraft. One recent example was the Somers-Kendal SK-1, for which they supplied various items in wood, metal and glass-fibre, plus a number of jigs and tools.

Current activities cover a very wide range of model, display and exhibition work for many types of industry, and Shawcraft number among their customers many of the world's major airlines and aircraft manufacturers. In recent years a large proportion of their production has been to fulfil export orders; Mr W. A. Roberts, who founded the company, is proud of the fact that 50 per cent of the 1960 output went to customers abroad.

IN BRIEF

Mr R. F. G. Lea, deputy chairman and joint managing director of CIBA (A.R.L.) Ltd, Duxford, Cambs, has been appointed a director of CIBA Clayton Ltd, Manchester.

Mr D. C. Lumsden, formerly service manager of Delaney Gallay Ltd, has joined Penetone-Paripan Ltd as aircraft technical representative. He will be responsible for marketing the specialized range of Penetone aircraft maintenance chemicals and safety solvents.

The aircraft liquid-oxygen breathing system used on the DH Sea Vixen which recently remained airborne for just over eight hours (*Flight*, June 15) was supplied by British Oxygen Aviation Services. Similar systems have been supplied for the Folland Gnat Trainer and English Electric Lightning.

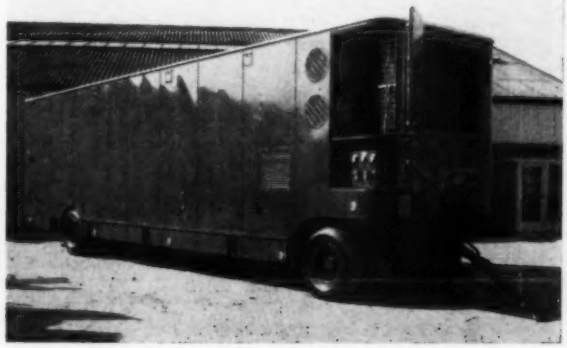
Admiral S. H. Ericson, Commander-in-Chief of the Royal Swedish Navy, recently visited Solartron at Farnborough, Hants, where tactical radar simulators ordered by the Royal Swedish Navy are being manufactured. Admiral Ericson was met by Mr John Bolton, deputy chairman and managing director, and Mr Lawrence Malec, group director responsible for systems.

Goodmans Industries Ltd report that at the recent British Trade Fair in Moscow they not only sold their entire display of vibration generators, power amplifiers and instrumentation but in addition obtained orders worth over £40,000 for the same category of products. They expect additional orders during the coming months.

Senior officers from Iran, Pakistan and Turkey visited Decca Radar factories and laboratories on June 21. The visit was organized as part of the UK contribution towards the 1961 programme of CENTO military training. The officers were met by Gp Capt E. Fennessy, managing director of Decca Radar. This was stated to be the first time a programme for CENTO visits to this country had included a leading specialist electronics company.

With the receipt of latest orders from the Royal Navy, RAF and aircraft manufacturers for low-pressure air starters and airborne power units, Blackburn Engines Ltd announce sales of over £3m worth of this type of turbine equipment. This is in addition to sales of other small turbines, latest of which is the Nimbus, the 1,100 h.p.-range free-turbine ordered in quantity for the Westland Saunders-Roe Scout (P.531) helicopter.

From fire tenders to airport coaches, from fuel tankers to missile transporters, the aviation industry helps to keep the motor-vehicle industry busy. Seen here are (left) the Bedford TK six-tonner which provided a launching platform for the dramatic Martin-Baker rocket ejection-seat demonstration at the Paris Show; and a Carrimore trailer on which Sparshatt's (Metal Bodies) Ltd have constructed a soundproofed light-alloy body to house a Redifon simulator being used by NATO to train German Air Force pilots for Sabres



SERVICE AVIATION

Air Force, Naval and Army Flying News

A Sea Vixen of 890 Naval Air Sqn, based in HMS "Hermes," firing a salvo of 2in rocket projectiles during the recent Shopwindow 1961 demonstration (this page, June 15)

Copperplate Trip

IN the longest nonstop flight ever made by the RAF a Vulcan of Bomber Command last week flew from the United Kingdom to Australia—from RAF Scampton to RAAF Richmond (near Sydney)—in 20hr 3 min. The aircraft's average speed for the 11,500-mile flight—which crossed France, Italy, Greece, Cyprus, Turkey, Iran, Pakistan, India, Malaya, Singapore, Indonesia and the Timor Sea—was 573 m.p.h. It was captained by Sqn Ldr M. G. Beavis of 617 Sqn, who with his crew won the bombing and navigation award in the annual Bomber Command competition last April. He had previously made long-distance nonstop flights to Nairobi, Gan and Karachi. On the way to Australia the Vulcan—a B.1a powered by four Mk 100 Series Bristol Siddeley Olympus engines, which Sqn Ldr Beavis commented "performed splendidly throughout the flight"—was refuelled by Valiant tankers of 214 Sqn flying from Cyprus, Karachi and Singapore. The crew were met on the tarmac at Richmond by Air Marshal Sir Kenneth Cross, AOC-in-C Bomber Command, who was visiting Australia. In a comment on the flight Sqn Ldr Beavis said it had been "a copperplate trip." Most of the journey was covered at an altitude of more than 60,000ft. The Vulcan took off from Scampton at 1135 BST on June 20 and arrived over Sydney at 0738 the following day. Its ETA, planned months before, was 0740.

Flying Training C-in-C

AFTER two-and-a-half years as chief information officer at Air Ministry, AVM G. A. ("Gus") Walker, CB, CBE, DSO, DFC, AFC, is going to Flying Training Command in September as AOC-in-C with the acting rank of air marshal. He succeeds Air Marshal Sir Hugh Constantine, KBE, CB, DSO, whose appointment as Commandant of the Imperial Defence College was announced earlier this month (*Flight*, June 8).

"Gus" Walker, who is 49, had a distinguished war record with Bomber Command, winning the DSO and DFC with No 50 Sqn. While station commander at Syerston he lost his right arm in a gallant attempt to rescue the crew of a burning Lancaster. He is also distinguished as a rugby footballer, having played for England in 1939, previously captaining the RAF XV (1936-39). He was an ADC to King George VI from 1943 to 1952 and to Queen Elizabeth from 1952 to 1956.

AVM G. A. ("Gus") Walker, who is to be AOC-in-C Flying Training Command from September 24 with the acting rank of air marshal (see news-item, this page)

Coachmakers and Comets

AT their Court and Livery Dinner in Tallow Chandlers' Hall on June 20 the Worshipful Company of Coachmakers and Coach Harness Makers officially adopted No 216 Sqn, the Comet squadron of RAF Transport Command. There as guests to mark the occasion were the Air Minister, Mr Julian Amery; the CAS, Air Chief Marshal Sir Thomas Pike; and the AOC-in-C Transport Command, Air Marshal Sir Denis Barnett. The former CAS, Marshal of the RAF Sir Dermot Boyle, was also present; and 216 Sqn was represented by its commanding officer, Wg Cdr N. E. Hoad, and two of the Comet captains, Fg Off J. Byrne and Fg Off G. de Looze.

The Master, Sir Reginald Verdon Smith, who is chairman and managing director of the Bristol Aeroplane Co Ltd, presided at the dinner; and Sir Aubrey Burke, deputy managing director of the Hawker Siddeley Group, proposed a toast to the RAF in which he paid tribute to 216 Sqn for its work in convincing the world that modifications applied to the Comets after the disasters of 1954 were satisfactory, and to the squadron's fine record of passenger safety. In his reply, Mr Amery referred particularly to the RAF's maintenance of a deterrent, saying that owing to a few hundred young men of the V-force, "as we sit around this table I believe we are safe from premeditated attack."

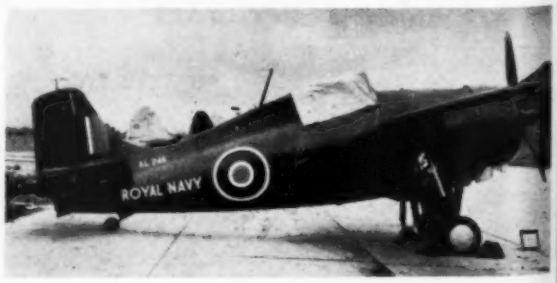
This is the company's second Service adoption. Some years ago they adopted the aircraft carrier HMS *Centaur*.

Yeovilton's 21st

YEOVILTON held its Air Day on June 17, a special occasion because this was the 21st anniversary of the first commissioning of HMS *Heron* as the Naval Air Fighter School (on June 18, 1940). The station's current role is that of land base for all-weather fighter squadrons equipped with Sea Vixen FAW.1s. It also flies the flag of FOFT and houses the Instrument Examining Board (Hunter T.8s), the civilian-manned Radar Instruction Flight (which recently moved from Brawdy) and the P.531-equipped 700H Sqn.

A low cloudbase (1,200ft) prevented a first public display of aerobatics by Sea Vixens of 899 Sqn, both the Vixens and 800 Sqn Scimitars having to give a "flat" performance. Among other items were a cavalcade of Naval aircraft (Sea Vixen, Sea Venom, Sea Hawk, Gannet, Sea Fury and Swordfish); a helicopter demonstration staged by Westland Aircraft (Belvedere, Wessex and Gnome Whirlwind); and a dummy frigate landing by a torpedo-equipped P.531 of 700H. In the static display was a Grumman Martlet, recently restored at Yeovilton after a long stay at Loughborough College. It is unlikely that this aircraft will ever be able to fly again as the fuselage is slightly bent and a number of parts are missing.

To mark HMS *Heron*'s birthday a large "cake" with 21 candles was flown onto the airfield attached to a Whirlwind. When it landed an attractive Wren emerged to distribute pieces of real birthday cake. This Air Day marked the final appearance of Sea Venoms as front-line Naval aircraft: the last squadron is being disbanded on July 1.



At HMS "Heron's" Air Day (see "Yeovilton's 21st"): low-level sharp-shooting from a Swordfish, and (at right) the recently restored Grumman Martlet with a canvas cover replacing its missing canopy

The first Caravelle 6R to be built for United, but actually the second to be delivered, is seen here at Le Bourget; it was demonstrated at the Paris Salon. A point of interest is the deeper cockpit windows. (See news-item on this page)

AIR COMMERCE

CUNARD EAGLE WINS

THE Air Transport Licensing Board has decided to grant Cunard Eagle a licence for a London - New York service, using Boeing 707-465s and Britannias. Frequency is to be once daily, and the licence is for 15 years—from August 31, 1961, to July 31, 1976. Manchester, Prestwick, Philadelphia, Boston, Baltimore and Washington (all designated points in the US-UK Air Agreement) may be served, although passengers cannot be carried from London to Manchester or Prestwick, (no domestic traffic rights); nor does the licence cover the carriage of mail. Cunard Eagle was refused rights to operate to Toronto, Montreal, Detroit and Chicago.

"We are surprised and deeply disappointed by the Board's conclusions," comments BOAC. "We shall personally appeal against them, as we have the right to do, in the strongest possible way. The Board's decision appears to accept that inevitably there will be diversions, and probably material diversions, of traffic from BOAC if Cunard Eagle operate successfully. If this be the case, BOAC's position on the North Atlantic will be undermined. BOAC had understood that it was the intention of Parliament, as embodied in the Civil Aviation Licensing Act, 1960, that this should not occur."

Significant—indeed, gratifying—is the fact that the Board foresees that the advent of another carrier will generate more traffic, but while admitting that there will probably be material diversion from BOAC the Board does not regard this in itself as necessarily a bar to the grant of a licence. Material diversion, it seems, is not such a bogy to the Board as it is to airlines, and the Board did not consider Cunard's unwillingness to bear the whole cost of replacing the *Queen Mary* as relevant to their ability to support a transatlantic air service. To license a second British carrier to Canada would lead to wasteful duplication, in the Board's opinion; nor was it thought that the US mid-west routes could economically support two British carriers.

Cunard Eagle proposes to start services with Boeing 707s in May 1962, and their 707 crews are to be offered terms and conditions of employment no less favourable than those of BOAC.

Although without a statistical staff to make an independent analysis of traffic-growth estimates proffered by rival airlines, the Board has nevertheless come up with some general comments on estimated traffic-growth between this country and North America. Their opinion is that from now until the late nineteen-sixties at least, the rate of increase between the UK and the US east coast and mid-west could scarcely be put at less than 15 per cent, nor at much more than 20 per cent per annum on average. There would appear to be a major difference of opinion about estimated traffic, says the Board, but the essential point was that the number of passengers would be in excess of 1m by 1966-67, and growing fast. The difference in the exact timing was small in relation to the uncertainties of the situation five or six years hence. "The rate of increase may receive an impetus by a more substantial reduction in fares than was assumed by BOAC in their evidence," the Board adds, acknowledging that traffic-growth would be retarded by any recession.

AIR TERMINAL FOR VICTORIA

AT last this country can look forward to the prospect of a degree of rail/air co-operation comparable to that of France, where several SNCF (French Railways) stations sell Air Inter tickets. British United Airways and the Southern Region of British Railways have reached agreement on the construction of a new £80,000 air terminal at Victoria Station, to be built over the railway platforms. It is hoped to have the terminal, which should be conveniently near the Battersea heliport, in use in the summer of 1962. "Our aim is to enable people to buy an airline ticket at every railway station in Britain," said Mr F. A. Laker of BUA, commenting on the new scheme. "This is the second co-operative venture between British United Airways and British Railways. The Eastern Region already operates a rail-air-rail service to the Continent in conjunction with Channel Air Bridge and Belgian National Railways."

Victoria's traditional rôle as gateway to the Continent will be enhanced by the new terminal, especially if a roof landing area for helicopters can ultimately be incorporated. Escalators will carry passengers and their baggage up from ground level. From the other side of the terminal hall a bridge will stretch across the tracks, with stairways down to the platforms; thus, after checking in for their flights, passengers can go straight to the trains taking them to Gatwick. This arrangement will have obvious advantages when "walk-on" services similar to those of Allegheny and Eastern are operated out of Gatwick on high-frequency routes.

The new terminal, and the proximity of Battersea heliport, once again emphasizes the need for a helicopter service linking Gatwick, the centre of London and London (Heathrow). And British United may now have a powerful ally in British Railways to support their requests for new European routes. The new terminal has been designed by Pascall and Watson of Westminster, and will be capable of handling over a million passengers annually; it will replace British United's Brompton Road Air Station.

On the debit side, congestion at Gatwick is causing a problem at peak periods. A BEA official is quoted as saying: "The Ministry has not enough porterage and the terminal building itself is not big enough. We are very worried about what will happen next summer." The Ministry's reply is that it is impossible to get sufficient casual labour for the summer periods; that it is expected to have students on vacation starting work soon; and that there is no evidence that delays are being caused by shortage of porters.

VERTOLS FOR BEA?

"INTERIM" is a word that, applied to airport buildings and helicopters, has an unpleasant habit of meaning "permanent." If BEA is allowed to buy Boeing-Vertol 107s as interim equipment pending availability of the Rotodyne, what effect will this decision have on the latter helicopter's future? This question is sure to be in Mr Thorneycroft's mind when he discusses BEA's proposed Vertol purchase with Lord Douglas; BEA would introduce Vertols in about two years' time, subject to Government sanction for dollar expenditure. Some dollars could be saved by specifying de Havilland Gnomes instead of General Electric T58s and, according to the *Daily Express*, BEA'S initial order would probably be for three aircraft costing about £600,000 with spares. This order may well have been announced by the time these words appear.

UNITED'S CARAVELLES

ON June 12 the first of the 20 Caravelle 6Rs for United Air Lines was christened *Ville de Toulouse*—which must contrast strangely with the "Mainliner" names of the existing UAL fleet. United's president, Mr W. A. Patterson, was invited to Toulouse by M. Georges Hereil, president of Sud-Aviation; and M. Bazerque, Mayor of Toulouse, welcomed the guests to the ceremony in the Capitol Hotel, at which the aircraft was formally handed over to the operator.

Ville de Toulouse is the 86th Caravelle to be completed, and on June 12 it had flown 93hr 26min; the second for UAL (actually the 62nd to be built) had at this time logged 11hr, and was demonstrated at the Paris Salon. Two other United aircraft will roll out this month; scheduled services are due to begin on July 14, and the entire fleet of 20 should be delivered by January 1 next.

NEW RIGHTS FOR THE IRISH

SPEAKING in Cork recently, Mr Jeremiah Dempsey, general manager of Aer Lingus Irish International, revealed that his company had secured traffic rights from Cork to Birmingham and/or Derby, Leeds and Bradford and/or Newcastle, Liverpool and Haverfordwest. Presumably the routes to Leeds/Bradford and Newcastle will be operated in pool with BKS, who have obtained rights to Cork on these sectors.

Since RAF operational requirements at Valley prevented Aer Lingus from operating their proposed Dublin-Anglesey coach-air service in 1959, the airline's commercial planning department has been searching for an alternative airport in Wales. Now it appears that Haverfordwest is the place: the distance from Cork to Haverfordwest is 140 statute miles compared with the 70 separating Dublin and Valley. Haverfordwest is about 100 miles from Cardiff and about 250 from London by road, and Cork is the gateway to the main tourist areas in the southern region of the Republic—the lakes of Killarney and the Ring of Kerry. Excursion return rates from Cork to Cardiff and London are respectively (with effect from October 1961) £10 and £15 6s, and coach-air rates for these two destinations might well be £7 15s and £8 15s for the round trip.

One of the many interesting visitors to Le Bourget during the Paris Salon was F-BELY, a Boeing SA-307B1 Stratoliner originally owned by TWA and now operated by French independent Airnautic GECA

ATLB 21st HEARING

SEVENTY-TWO applications, from eight applicants (British European Airways, British United Airways, Cunard Eagle Airways, East Anglian Flying Services, Overseas Aviation, Silver City Airways, Starways and Tradair) are being heard at the current (twenty-first) public meeting of the Air Transport Licensing Board. They are all for Class "A" licences to operate scheduled services, and have been divided into two groups. Group "A" consists of 60 applications for licences to operate services from the United Kingdom to Europe, and Group "B" of applications for domestic routes. All the applications are opposed, none by less than two objectors, and at least one by as many as six.

To deal with all this business the Board set aside the afternoon of June 20, and all day on the 21st; these hearings will continue on 29th and 30th and then on nine days in July and two in August. Other dates will be set aside if necessary.

At the opening of the first session of this meeting, the chairman, Prof D. T. Jack, said that they would first hear general evidence in connection with the applications in Group "A." Only BEA, BUA, CEA and Tradair had indicated that they wished to present any general evidence in support of their applications and they were therefore invited to address the Board in alphabetical order. At this stage it was generally understood that it was intended that the general cases for these applicants would be stated and supported by evidence.

Mr Henry Marking, secretary of BEA, spoke first and suggested to the Board that, as the BEA general case in objection would be applicable to all cases, he would like to state it after the other three general cases in application had been made. The necessity of stating the objection three times would thus be avoided, which he thought would be desirable in the interests of brevity; the Board agreed and Mr Marking proceeded with the statement of BEA's general case in application.

The corporation's applications—for services to Genoa, Marseille, Malaga and Madeira—differed, he said, from all the others in that they were the only ones which did not conflict with established services. He quoted the responsibility of BEA under the Air Corporations Act of 1949 for the development of services, traced the corporation's route development since its formation 15 years ago, and explained why these routes were not yet being operated, although Genoa, Marseille and Malaga were connected by ground transport or by local air services to other centres to which BEA operated. In Madeira there had been no suitable aerodrome until recently. The object of the proposed routes was to improve services to Spain, Italy and France.

Mr Marking then turned to the provisions of the Civil Aviation (Licensing) Act of 1960, dealing particularly with the conditions to be met under the provisions of Sec. 2 (2). In stating his case so far as it concerned Sec. 2, (2), (a), he claimed that the corporation had unrivalled experience, as could be seen from its past record—about which he then produced a good deal of published evidence.

The borrowing powers of the corporation—£95m—would, he said, amply cover the new operations. BEA's staffing arrangements would be dealt with in detail later, but he suggested that their sales organisation, with 29 UK offices, 44 Continental offices and many agents could not be matched.

Here Mr Marking referred to the undertaking which Cunard Eagle had said, at the recent hearing of their Atlantic application, were prepared to give in respect of aircrew pay, and asked whether the other applicants at this meeting would be prepared to give a similar undertaking in respect of aircrew and ground staff.

In connection with Sec. 2, (2) (g), Mr Marking mentioned the commitments of BEA for purchase of aircraft during the period 1961-65. In their planning they had provided for the operation of the four routes for which they were applying. If the applications were not granted there would be lower utilization and, therefore, less economic operation of aircraft.

Summing up his case, Mr Marking said that the routes applied for were part of the planned development of the corporation's services. The traffic on three of the routes was already carried by BEA, but not direct; Madeira would be a new route, but was justified by the traffic potential. Provision had been made for aircraft to operate the proposed routes, and the sales and maintenance organizations were adequate.

Mr Gerald Gardiner, QC, appearing for British United Airways, began by apologizing for raising two points of law—pooling agreements and inter-governmental agreements. With regard to pooling agreements, he submitted that these were not commercial agreements in the true sense of the word; if, however, they were to be regarded, for the purposes of Sec. 2, (2) (g) as commercial agreements, they should be properly put in as evidence available to the other party. It was an accepted principal of law that a decision could not be taken against a party based on evidence which that party had not had the opportunity to refute or question.

With regard to inter-governmental agreements, Mr Gardiner submitted that these were not really matters for the Board to consider, since the responsibilities of the Minister in this connection were laid down in the Regulations. BUA did not object to the Board taking inter-governmental agreements and pooling agreements into account, but did not wish to miss making the point that a licence could not be refused solely on the grounds of the possible effect on such agreements: in any case, with regard to pooling agreements, he suggested that BEA should either agree to making full details of the agreements available or withdraw them from the case.

The chairman intervened to make it clear that the pooling agreements had not yet been read by the Board, pending a decision at the hearing as to their admissibility as confidential documents. This course had been suggested to the Board by the interested parties.

Invited by the Board to comment on Mr Gardiner's remarks, Mr Marking said that the pooling agreements were not secret; copies had been in the hands of the Ministry since they were signed. He would call evidence to show that they had been reasonably entered into.

Inter-governmental agreements restricted BEA capacity on various routes and commercial (pooling) agreements had helped to alleviate this situation and to ensure that BEA got the lion's share of the market. Publication of the details would seriously prejudice the future. The agreements had been entered into as confidential agreements and the other parties to them were not agreeable to publication of the terms.

Mr Marking suggested that Reg 9 covered the case and maintained that it would be proper for the Board to consider the pooling agreements under Sec. 2, (2) (g) of the Act of 1960. He could not understand BUA's attitude. They had a pooling agreement with BEA on the Gibraltar route and, in April 1960 had themselves objected to the corporation's making this agreement available to the Board. He suggested that he could, if the Board wished, formally withdraw the pooling agreements; the Board would then be able to ask for them under the provisions of Reg 9.

The chairman then asked whether Counsel for BUA would be prepared to accept a statement of the general terms of the agreements. Mr Gardiner replied that BUA did not like pools and had no pooling agreements. One of the companies now taken over by BUA had a pooling agreement with BEA on the Gibraltar route. BUA felt that pools obstructed the progress of British Civil Aviation as a whole.

At the suggestion of the chairman, it was agreed to defer a decision on the admissibility of pooling agreements as confidential documents. Counsel for BUA then continued. He said that BUA satisfied the requirements of Sec. 1 of the Act of 1960, and commented that no objection had been made under the terms of Sec. 2, (2) (a). He mentioned, however, that BUA's gross assets of £17m were three times those of all the other independent companies concerned together. He outlined the history of the airline and its predecessors and introduced a document BUA/1 giving further details of its history and structure. All this had been achieved without the help of any subsidy or public money, he said, and added that no reflection on any other organization was intended.

Further procedural arguments followed and the chairman referred to Reg 7 (3), pointing out that, as BEA had particularized certain objections these were, presumably, the only ones which they wished the Board to consider.

Mr Marking said that he would accept this ruling, but the Board had, in any case, to be satisfied by the applicants with regard to Sec 2, (2) (c). BEA had wanted an assurance similar to that given by Cunard Eagle to BOAC; he now understood that BUA would not give this.

Mr Gardiner continued, with reference to sub-Sec. 2, (2) (e) (f) and (g), and said that Channel Airways seemed to be objecting on the grounds that they might want the routes and the current applications were therefore prejudicial; BEA were objecting on the basis of all sub-Sec. from (d) to (g).

The chairman here intervened to ask whether Mr Gardiner was speaking to BUA's applications, or to its objections; Mr Gardiner said that he was speaking to the applications, but it was not easy to separate the two. He then referred to document BUA/2, which, he said, showed traffic trends proving the need for the proposed services. Traffic on the Atlantic routes had gone up as the fares had gone down. Fares in Europe had gone up and BUA would press with IATA for their reduction. Reductions would open up untapped markets.

He said that he did not expect much dispute on the forecasts of traffic growth, as the estimates of BEA and BUA were roughly the same. BUA were now suggesting that the independent operators should be allowed a share of the traffic amounting to 20 per cent of the anticipated increase up to 1965. It was for the Board to decide whether the independents should now be allowed a share of the routes previously reserved for the corporation.

Mr Gardiner referred to the purpose of the Board as defined in the Civil Aviation (Licensing) Act and suggested that the Minister, having "spoken fair words to both the corporations and the independents," had left it to the Board to reconcile the parties. He quoted at length from the reports of Parliamentary debate on the Civil Aviation (Licensing) Act with reference to equality of opportunity and from comments in BEA's annual report on the limitations of the "material diversion" clause. He suggested that it was for the objector to satisfy the Board that there would be material diversion.

This ended the first session of the meeting.

Lack of Competition

On June 21, Mr Gardiner, counsel for BUA, continued his general statement with the comment that it was difficult to separate objection and application, but he would address the Board in general terms and keep off details. He suggested that the Board should have as its general principle "to further the development of British civil aviation" as stated in Sec 1 (1) of the Act of 1960 under which it was set up. To give everything to the corporations or to the independents would not accord with the Act. It was for the Board to share out the cake in such a way as to "further the development of British civil aviation."

The independents could have applied for the cancellation of the corporation's licences, or they could have suggested exclusive rights for the corporations and for the independents on certain routes. What they had done was to apply for about 18 per cent of the future increase on a number of routes. BUA had not applied for exclusive rights on any route so as not to affect the corporation's pattern of operation unduly, and so as to avoid route monopolies which would have eliminated beneficial competition.

The corporation would still have the advantages of travelling habits of the public—who had become accustomed to using BEA services—and of providing approximately 90 per cent of the total capacity. They also had the advantage of paying a much lower rate of interest on capital than the commercial rates paid by the independents. For these reasons, BEA would be well able to stand competition.

It was BUA's case that the development of British civil aviation was being hampered by the lack of competition. Some degree of regulation of traffic was desirable but pooling agreements carried this to excess. If a passenger became fed up with BEA on, say, the Paris route and decided to go by Air France, BEA couldn't care less because of the pooling agreement, with agreed schedules, agreed capacity and shared receipts. Standards therefore suffered because neither BEA nor the other party to a pooling agreement would suffer if passengers switched from one carrier to the other.

A desirable load factor was about 60 per cent, but summer load factors were 80 to 85 per cent on the Paris route, which meant that the public was not getting good service, because it was frequently impossible to book on the most suitable flight. In some cases, such as the TCA/BOAC Atlantic pool, an agreement of this nature might be justified in order to meet strong competition; or a pooling agreement with a strong competitor might be justified in self-defence.

He would not suggest that BEA had been to blame for entering into pooling agreements in order to get their services going, but suggested that the pools were now obstructing the development of British civil aviation.

The degree of control of pools through inter-governmental agreements varied, but this was a matter for the Minister, who could direct the Board to reject any application which would involve the breach of an inter-governmental agreement.

Mr Gardiner also quoted opinions which had been expressed by Mr Masefield, a former chief executive of BEA, on the "grave economic dangers in a policy of pooling."

It was part of the BUA case, he continued, that new markets awaited development. The forecasts prepared by BEA and BUA were based on past trends, but independents had shown that new factors such as charter operations, coach services and inclusive tours could affect the future. BEA were not to be blamed for not pioneering these developments; they had had their scheduled services to look after. BUA wanted to pursue a policy of fare reduction such as had been followed on the North Atlantic.

BEA would probably argue that they were entitled to protection on profitable routes as they lost money on some domestic routes which they had to operate. This was not a relevant factor as such protection was not provided for in the legislation on air transport as it had been in connection with road transport.

Mr Gardiner then referred to costs analysed in the document BUA/1, which would show that costs of air travel could be reduced for those passengers who were not interested in luxury but wanted to get to their destinations fast and at low cost. He also referred to the plans for building a town terminal at Victoria station, and for improvements at Gatwick. He said that the Gatwick plans did not depend on the outcome of the applications; the plans for Victoria station might not mature if the applications were unsuccessful, but all details had been fully worked out.

(*To be continued*)

TESTING THE MINISTER'S INTENTIONS

DISPOSAL by the Minister of BOAC's appeal against the ATLB's grant of a transatlantic licence to Cunard Eagle will be the crucial test of his predecessor's declared intention that the Board shall be independent. "It is my intention," said Mr Duncan Sandys, the Minister of Aviation who created the Board, "that the Board shall be independent." Having said this, he retained control over the approval of international fares, the negotiation of traffic rights and the disposal of appeals. At one stage he was even going to consider appeals himself, but he thought better of this and agreed to appoint an independent commissioner to make recommendations.

Appointment of this commissioner will now be the next move; there will then be another public hearing at which the parties can, if they wish, submit new evidence. But the Minister will have the last word: if he does not like the commissioner's recommendation he can reject it.

It is by no means a foregone conclusion that Cunard Eagle will get their licence, particularly as the Minister must be as concerned as BOAC about the corporation's really serious surplus of capacity on the North Atlantic. But if he vetoes the Board's first major decision he will confirm what has always been suspected—that the Board is only as independent as the Minister, guardian of the corporations, wants it to be. The Minister will have to balance his responsibilities to BOAC with those that he bears towards the British aircraft industry, and the Government's declared intention of giving financial support to the VC10, amongst other types, which Cunard Eagle may well order. He will also have to take into account possible trade union reaction towards independent competition on one of BOAC's plum routes. The corporation will probably make the point in their appeal that their future fleet planning is going to be very difficult if they do not know on which routes they will be up against independent competition.

Mr J. L. Watkins, technical director of Trans-Australia Airlines (second right) and Mr R. A. Meehan, UK manager of T.A.A. (right) inspecting an engine mock-up in the model shop during a recent visit to the Patchway, Bristol, works of Bristol Siddeley Engines Ltd. With them are Mr P. F. Green, Bristol Siddeley's deputy chief engineer (aero design) (left), and Mr B. S. Massey, an assistant chief engineer

A pleasing portrait of the first Fokker Friendship for All Nippon Airways, whose first Viscount was illustrated in these pages last week. Another new customer for the Friendship is DETA, as announced below

AIR COMMERCE . . .

FRIENDSHIPS FOR PORTUGUESE EAST

FOKKER announced on June 15 that in Lourenço Marques the previous day the Mozambique airline DETA had signed a contract for the purchase of three Friendships, which for some months had been on option. These aircraft, powered by Rolls-Royce Dart 528s, are due to be delivered in August 1962, when they will replace much of the existing fleet of DC-3s, Lodestars, Ju52/3ms, Doves and Rapides.

DETA are Government operators, founded in 1936, maintaining passenger and freight services throughout Portuguese East Africa and the cities in the Central African Federation and the Union. They are the 64th Friendship customer (185 of these aircraft have now been sold, including Fairchild production) and their executives are expected at Schiphol shortly to draw up the final specification.

Later this year Sudan Airways will introduce the Friendship on routes centred at Khartoum. Fokker's negotiations with other African operators have reached an advanced stage.

CAB v. THE WORLD

THE comparative simplicity of government in England makes it difficult for us insular chaps to understand the true nature of the struggles in the United States which can occur between any State in the Union and the Federal Government, or between Big Business and the Federal regulatory agencies, or even between different Federal agencies. We can perceive the factual problem of, say, racial integration, but it is not so easy to see it as a problem of States' rights versus Federal Law. We can see the undesirability of vast business monopolies, but we can still be a little startled to find business executives in goal for price-fixing, which (until recently, anyway) was quite respectable in England.

The Civil Aeronautics Board is a Federal regulatory agency created by Congress primarily to supervise the economic regulation of air transport, conduct major accident investigations and hear appeals from certain decisions of the Federal Aviation Administrator. We have no true equivalent of the CAB over here because we have neither the Federal system of government nor America's kind of anti-trust and monopoly laws; but the rough UK equivalents of the functions of the CAB would be:—

Route licences	Air Transport Licensing Board.
Appeals from air navigation licensing decisions ..	A Commissioner, and the Minister of Aviation.
Accident investigation ..	Chief Inspector of Accidents, and a Commissioner (at public inquiries).
Anti-trust and monopolies ..	The Monopolies Commission and the Registrar of Restrictive Trading Agreements (if they dealt with airlines—which they don't).

Among the things the CAB is *not* responsible for are foreign policy and foreign relations; these are the job of the State Department.

UK carriers may think they have a thin time complying with the Civil Aviation Act 1949 and the Civil Aviation (Licensing) Act 1960. I suspect that many of them would rather take up gardening than comply with the complex system of controls set up under the Federal Aviation Act 1958 and its predecessors.

CAB Role in Relation to Foreign Carriers Sovereign governments regard invasions of their airspace—even for honest trade—as so many pinpricks in their dignified sovereignty. Air-service agreements between nations are subjects of serious top-level diplomatic discussion, with the airlines discreetly in the background whispering and cursing their luck with many degrees of Freedoms. The accent remains on the traditional channels of diplomacy, no matter how many expert advisers and vulgar tradesmen may be in attendance.

On my left, the US State Department, with advisers from the White House, the CAB, the Department of Commerce, PanAm, TWA, and so on. On my right, Her Majesty's Foreign Office, with advisers from the Ministry of Aviation, BOAC, Cunard-Eagle, *Flight*, etc.

But the result is inevitably a diplomatic agreement between two sovereign powers: a bilateral air services agreement. It is not an agreement between the State Department and BOAC, or between the CAB and Her Majesty's Government. It is one between the USA and the UK, and in its present form it is still referred to as the Bermuda Agreement.

One feature of the agreement is that each airline must adhere to the laws and regulations of the nation whose airspace is being visited. Pan American must fly in accordance with UK air traffic control. BOAC must obtain a foreign carrier permit from the CAB. In fact the CAB will only issue the permit "if it finds that the applicant is fit, willing and able to perform such transportation, and to conform to the provisions of this Act and the rules, regulations and requirements of the Board hereunder, and that such transportation will be in the public interest." [Section 402 (b) of the Federal Aviation Act, 1958.] If that isn't enough, "The Board may . . . attach to such permit such reasonable terms, conditions, or limitations as, in its judgement, the public interest may require." [Section 402 (e).]

It looks as though the CAB have the whip hand. And so it might be—without our Fairy Godmother: May I introduce Section 1102? "In exercising and performing their powers and duties under this Act, the Board and the Administrator shall do so consistently with any obligation assumed by the United States in any treaty, convention or agreement that may be in force. . . ." Saved by the great Belle of Bermuda! In other words, the CAB must act in conformity with the Bermuda Agreement so far as the UK is concerned. To make sure that this is so, foreign-carrier permits "shall be subject to the approval of the President." [Sec. 801.]

In relation to foreign carriers, therefore, the CAB is not its own master: it is subservient to the Executive and the inter-governmental agreements. It has a vital role as watch-dog; it must investigate and bark in the public interest. But only one person controls effective action thereafter—Mr President.

Control of Frequency and Capacity As every air-transport schoolboy knows, one of the most famous features of Bermuda is the complete absence of any formulæ which will *pre-determine* the frequency and capacity offered by each State. That is not to say that the agreement ignores these subjects.

On the contrary, the primary object of services has to be the provision of capacity adequate to the traffic demands between the carrier's respective homelands and the country of ultimate destination (not necessarily either the UK or the USA). Moreover, "capacity should be related: (a) to traffic requirements between the country of origin and the countries of destination; (b) to the requirements of through airline operation; and (c) to the traffic requirements of the area through which the airline passes after taking account of local and regional services." (Clause 6 of the Final Act.)*

There are also provisions permitting a "change of gauge" to smaller aircraft for connecting services—subject, however, to observance of the above principles of capacity (Annex V).

In the Agreement there is no specific mention of frequency: but, since capacity is the product of a number of seats and a frequency of service, it may safely be concluded that the general reference to capacity would normally comprehend "frequency" as one of its parameters. Or, as my headmaster used to say, more shortly:—

C = f (N, F), where C = capacity, N = number of seats available per service and F = the number of services per unit of time.

* Cmd. 6747.

Finally, there has to be a fair and equal opportunity for the designated carriers of each nation to operate any agreed route, and the facilities available should be geared to "the requirements of the public."

CAB's Role under the Bermuda Agreement "... it is the intention of both Governments that there should be regular and frequent consultation between their respective aeronautical authorities (as defined in the Agreement) and that there should thereby be close collaboration in the observance of the principles outlined herein ..." [Clause 9.] The term aeronautical authorities means:—

For the UK: "the Minister of Civil Aviation for the time being, and any person or body authorized to perform any functions presently exercised by the said Minister or similar functions ..." (Query—does this now include the ATLB? Happy thought.)

For the USA: "the Civil Aeronautics Board and any person or body authorized to perform the functions presently exercised by the Board or similar functions." [Appendix I, Article 12.]

Therefore the CAB is the right body to consult with our own Ministry concerning the operation of the agreement on all matters—including the question of capacity. In fact "The Board is empowered ..." by Congress "to exchange with foreign governments, through appropriate agencies of the United States, information pertaining to aeronautics." [Sec. 204 (c).] The accent in Bermuda appears to be on "regular and frequent consultation."

What is the CAB Trying to do? The CAB is proposing to make a new regulation which would give it power (a) To call for complete operating schedules from foreign carriers and (b) To forbid such carriers from operating such schedules as the Board may decide. In other words, the Board proposes to regulate frequency and capacity of foreign carriers operating into the USA. (Incidentally, it seems slightly unnecessary to call for operating schedules, which are usually well publicized in the various airline guides and timetables.)

Not unnaturally, the airlines of the world who operate into the USA are protesting at this measure. They should not be too concerned, so long as the Board does not invade the principles of Section 1102 of the Federal Aviation Act 1958. If the relevant bilateral agreement permits the CAB to adopt such a peremptory attitude, then this is a mere implementation of existing agreements. But if, as in the case of the UK, the Bermuda Agreement does *not* allow such high-handed action without prior consultation, then the CAB cannot use their proposed new rule except in accordance with existing international agreements.

All doubts about the validity of the proposed CAB rule could be removed if the text contained a specific preservation of rights under all international agreements entered into by the USA.* As things stand, it might be necessary for the UK to await violation of the Bermuda Agreement before it could complain to the USA.

Who can say Boo to the CAB? It is quite possible that all the rude words of foreign airlines, and all the formal protests by foreign governments, may fail to dissuade the CAB from adopting its new rule—which could make it as powerful in the affairs of foreign airlines as it now is in relation to American carriers. No trouble would arise until the Board started to flex this new muscle. In effect, the Board would seek to impose variations on current and future foreign carrier permits. What then?

Whatever action the Board takes "shall be subject to the approval of the President." [Section 801.] So the final word on the subject would come from the White House, and there is no reason to suppose that the New Frontiersmen will suddenly wish to abrogate existing international air service agreements merely to please the CAB. Result:—

Dignified Scrap No 1—CAB v. White House. The winner? My money would be on Mr Kennedy.

Suppose the CAB seeks to *alter* the bilaterals? For example, the Bermuda Agreement? This is the job of the Executive—in particular the State Department. So the Board would have to convince the State Department that certain bilateral agreements needed rewriting to give the CAB a free hand.

"The Secretary of State shall advise the Administrator, the Board, and the Secretary of Commerce, and consult with the Administrator, Board or Secretary, as appropriate, concerning the negotiations of any agreement with foreign governments for the establishment or development of air navigation, including air routes and services." [Section 802.] Result:—

Dignified Scrap No 2—CAB v. State Department. The winner? It all depends on the state of international relations with the country concerned.

So far as the UK is concerned, negotiations on the air services agreement are still continuing and could, with the consent of the State Department, include these very thorny points raised by the CAB proposals. In fact, the chairman of the CAB has been reported as saying that the principles of Bermuda were open to serious criticism and that "it is questionable whether we can hold on to them." It is unlikely that the UK would abandon the principle of joint consultation on any matters of a kind involving capacity.

It is not easy for an outsider to guess the real motives behind the CAB's moves—which may be *bona-fide* as being justified in the interests of the American public. It may be that Pan American or TWA have suffered unduly at the hands of autocratic foreign governments and the CAB is anxious to redress the balance. If the troubles are deep seated then they may not be eliminated during the two Dignified Scraps referred to above. The pressures will still remain and fall to be dealt with in the mighty labyrinth of Congress. We must wait and see.

HAROLD CAPLAN

* This is, strictly speaking, unnecessary, having regard to the superior power of Section 1102.

CAPITAL IN RETROSPECT

ALTHOUGH United and Capital are still operating under separate titles, the merger between the two took effect on June 1. As a result, a British aircraft manufacturer will for the first time have a shareholding—and quite a substantial one—in a US airline. Vickers' holding in United has not led to the US anti-trust laws being invoked, nor has CAB disapproval of it delayed the merger. An interesting question is whether Vickers, as shareholders, will be in any position to influence United's future equipment decisions—in particular, towards choice of the BAC-One-Eleven as against the Caravelle Junior as a replacement for United's 27 Convair 340s and 41 Viscounts.

Why did Capital, for three years the only US carrier with turbine equipment, fail so badly? There seems to be no single answer, and the airline's management and the Viscount have both been blamed. The company's president, Gen D. H. Baker, has attributed the decline to failure to improve the route structure and to get rid of short local-service routes; to purchase of as many as 60 Viscounts, aircraft with what he chose to describe as "an extremely poor" profit potential unsuited to Capital's routes; agreement to amortize complete Vickers debt in five years; failure to raise equity capital when Capital's stock was strong at the time of the Viscount purchase; and failure to sell obsolete equipment.

Others disagree strongly with Gen Baker's analysis, maintaining that the Viscount was an excellent aeroplane but that it was misscheduled and was fitted with too few seats (44 at first, later 46). Capital's management, it is claimed, failed to realize the impact of scheduling on economics: if, early last year, equipment had been diverted from the south, where it was running empty, to the west, where business was better, results could have been $400,000 a month better. With more seats and more aggressive sales backing, the Viscount's competitive qualities could have been used to full advantage.

It seems surprising that Capital never developed a high-density interior similar to that of BEA's 63-passenger V.701s. Such an interior, with seats folding aside to allow the carriage of freight, would have enabled the coach and cargo markets to be developed more aggressively than they were.

A more valid criticism of the Viscount is that Capital ordered too many; instead of 60 about half that number should have been

As described in the text above, Capital's fleet of 41 Viscount V.745s were integrated with United on June 1, making UAL the West's largest airline. Other US Viscount operators are Northeast and Continental

AIR COMMERCE...

ordered initially, with repeat orders for the larger Viscount 800 offering lower seat-mile costs. It is ironical to reflect that Capital's 1956 order for the short/medium-haul Mk 4A version of the Comet really marked the point when the pure jet began to be taken seriously by airlines for short-stage work; yet Capital was unable to complete financing for jets, and has recently been operating Boeing 720s leased from United.

Of the 15 Capital Viscounts returned to Vickers, eight have been sold: five to Alitalia, two to Austrian Airlines and a third to Philippine Air Lines. Speaking of the Vickers holding in United at his company's annual general meeting on June 6, Viscount Knollys said: "If we were to value these securities under present market conditions and add the estimated proceeds of the sale of the aircraft, we arrive at a final figure of something over £9m, after taking into account all recoveries. The ultimate loss . . . cannot, of course, be finally calculated until all the securities and the aircraft are realized; but if for the time being we assume the above value, the balance of the loss would be about £2m. This, as we have said, can properly be charged against contingencies reserve, the actual amount being the above loss less tax."

Vickers will receive $15.9m (£5.7m) of new United 5½ per cent preferred stock, 60,000 shares of United's common stock and the right to purchase up to about the end of 1967 200,000 shares of common stock at $45 (£16) per share. United has CAB permission to suspend service to eight points on Capital's less profitable short-haul routes, and with Capital's network added to its own will serve a total of 117 cities. It is now by far and away the world's biggest airline, with the exception of Aeroflot.

BOAC AND BEA TRAFFIC, 1960-61

AN item under the above title on page 882 of our June 22 issue stated: "For the time being we must await the opportunity to examine the two corporations' finances—though it is known that BOAC expects to show a profit of at least £1¼m, while BEA expects to show a reduced loss of about £1¾m." Readers familiar with the corporations' finances will, of course, have appreciated that the airlines had been transposed. The error is, nevertheless, regretted.

THE RATE FOR THE JOB

THE unusual spectacle of one independent operator objecting to another on the ground that he should charge more was seen at a recent Air Transport Licensing Board hearing. Capt Parsons of East Anglian Flying Services was submitting rates for his company's vehicle-ferry services between Southend and Guernsey or Jersey. These had been computed on the general basis of the charges applied by Channel Air Bridge on the Southend-Rotterdam route, with adjustment for the mileage difference. Mr Franklin, for Silver City, objected on the ground that these rates were too low; the distances from Southend to the Channel Islands were roughly twice those from Bournemouth, and the rates should therefore be higher. At the rates proposed, East Anglian might seriously divert traffic from Silver City's Channel Island services.

It transpired that Silver City did not expect that bookings would justify the operation of the three daily flights to the Channel Islands for which they were licensed. They would probably operate only two, and it was unlikely that these would carry full loads. Capt Parsons thought that Silver City's failure to publicize its vehicle-ferry services to the Channel Islands might well account for the present low load-factor, and Mr Franklin admitted that Silver City were not pushing this service, as they preferred to concentrate on routes which showed the best commercial prospects. Capt Parsons made the point that it seemed illogical for Silver City to object to another operator serving the Channel Islands when they were not prepared to operate to their permitted frequency and preferred to concentrate on other routes.

NEW US HELICOPTER CARRIER

SAN FRANCISCO & Oakland Helicopter Airlines Inc, which started regular services on June 1, has two claims to distinction: it is the first helicopter airline in the world to fly an all gas-turbine fleet and—unlike Chicago Helicopter Airways, Los Angeles Airways and New York Airways—it intends to operate on a non-subsidy basis. Two amphibious Sikorsky S-62s will link the San Francisco and Oakland airports with downtown heliports in both cities, about 30 daily flights being scheduled between 6.30 a.m. and 10.30 p.m.; this frequency will be doubled on June 15. Berkeley, Palo Alto, San Jose and Sacramento will be added to the network in the near future.

The new helicopter airline was formed by a group of former Los Angeles Airways personnel: M. F. Bagan, president and treasurer of the new carrier, was formerly vice-president/assistant to the president of LAA. The S-62s are leased from Sikorsky at a monthly rental of $5,000 per helicopter for the year ending May 31, 1962; an option provides for an additional eight months' extension at $6,750 per month. The new San Francisco operator has also paid Sikorsky $27,500 per S-62 at the time of their delivery, and has an option to purchase them on or after May 31 next year at $228,458 per aircraft; the $27,500 security deposit would be credited to this amount in the event of purchase. Maintenance and overhaul is to be subcontracted, Sikorsky furnishing main and intermediate rotor transmissions, main and tail rotor heads and tail transmissions at a rate of $15 per flight hour as these components are removed for overhaul. General Electric will maintain and overhaul the CT58 turbines at a fixed charge of $10 per flight hour for parts and a labour charge of $3,500 per engine overhaul.

ALITALIA TO SYDNEY

ALITALIA became the eleventh international airline to operate to and from Australia when it inaugurated its new service to Sydney on June 16, using DC-8s chartered from TAI with Alitalia cabin service. The present route is via Teheran, Karachi, Bombay, Bangkok, Pnom-Penh, Djakarta and Darwin—although (as related in *Flight* for June 1, page 773) the Italian carrier hopes that its Sydney services will be routed through Hong Kong and Bangkok rather than through Djakarta, Pnom-Penh and Karachi. Alitalia DC-8s have now replaced DC-6Bs on services to Rio, Sao Paulo, Montevideo and Buenos Aires.

BREVITIES

Capt E. S. S. Nash, senior pilot of Central African Airways Corporation, has been appointed their manager in South Africa.

The Export-Import Bank is to lend Air India $8.1m to help finance two extra Boeing 707-437s it has ordered.

The Republics of Dahomey and Niger have now become member-States of ICAO, bringing total membership of the organization to 86.

OK-OFA, the Morava L-200A air taxi demonstrated at Gatwick Airport recently (*Flight*, June 22), flew back non-stop from Gatwick to Prague on June 16 in 4hr 37min.

An El Al Boeing 707 has inaugurated what is claimed to be the world's longest non-stop air service, between New York and Tel Aviv, with a flight of 10hr 20min. Weekly non-stop flights are planned.

Mr F. A. Reeves, TEAL's general manager, has told the airline's apprentices that Tasman's Electras are flying 4,000hr a year and will be used to their full capacity until the Mangere international airport is completed in 1964, by which year TEAL should have its own jets.

According to reports from Mexico the £3,570,000 SAS share in Guest Aerovias Mexico is to be taken over by a Mexican syndicate of 200. Shares owned by the founder and president of the airline, Mr Winston Guest, and worth about £1,780,000, will also be taken over.

A Pan American DC-8 *en route* from Oslo to New York made an emergency landing at London (Heathrow) on June 17 with a suspected brake fault, while a similar landing was made two days before by a Toronto-bound 707 after its undercarriage had failed to complete retraction and was re-lowered manually. A London-bound BOAC Comet had to return to Singapore after ingesting a sparrow in one of its intakes.

Eastern's first two Boeing 720Bs are scheduled for delivery on August 18 and 31.

Papuan Air Transport's fleet was grounded for 17hr recently by the Australian Department of Civil Aviation after three of its aircraft had been lost in six weeks.

Negotiations are to start soon regarding possible air services between the USA and Russia; similar talks last year were not resumed after the U-2 incident.

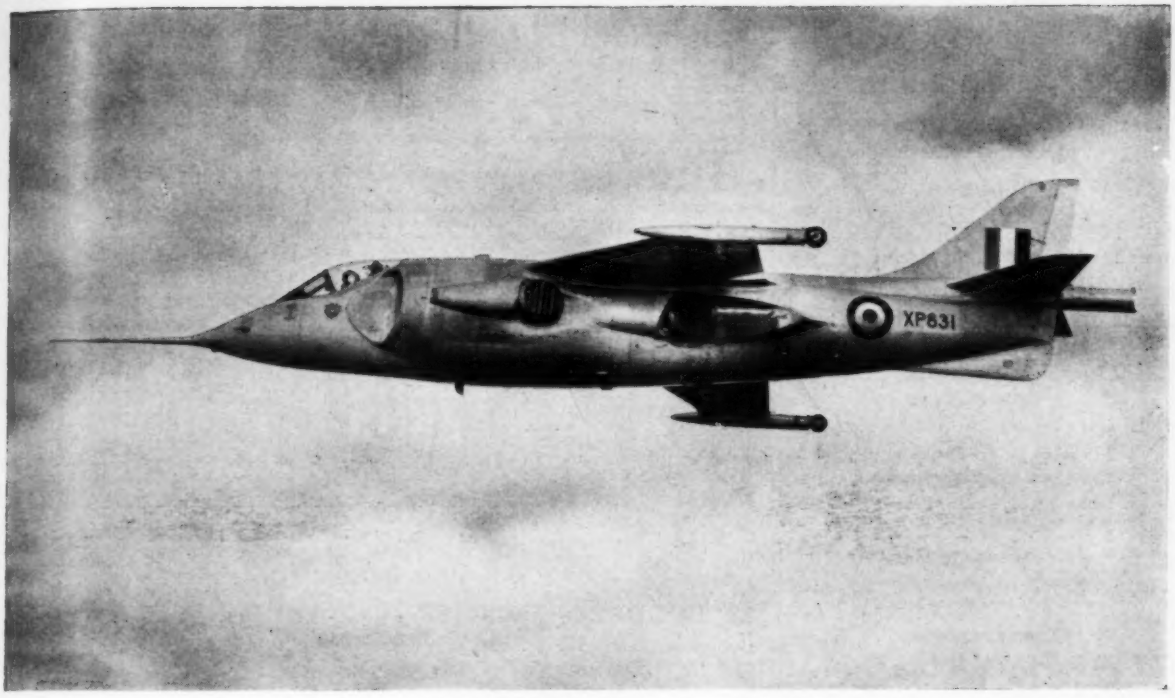
Road Research Technical Paper No 52, "The Use and Control of Vegetation on Roads and Airfields Overseas," has recently been published, price 3s 6d net, by H.M. Stationery Office.

TWA has claimed four transatlantic Boeing 707 "records" from New York: 5hr 19min to London, 4hr 51min to Shannon, 5hr 32min to Paris and 5hr 54min to Madrid.

BEA Vanguards have now taken over some Viscount services on the indirect London-Malta route with stops at Palermo, Rome or Naples. The Vanguard cuts the flying time between London and Malta by 60min.

According to *Aviation Daily*, Finnair is to buy jets for a Helsinki-New York route to be inaugurated next year. The same source reports that KLM's choice of a medium-range jet has been narrowed down to the Caravelle and Boeing 727; whichever is chosen, six to ten will be ordered initially.

Qantas have had xerographic copies made of the notebooks of the Australian aeronautical pioneer Lawrence Hargrave as the basis for a biography for which they are making a grant to an Australian scholar. The copy work, from a microfilm of the notebooks, was carried out by the Rank-Xero copy service, 40 Wilson Street, London EC2.



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H.191

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NOTE: Assistance will be given in obtaining married accommodation.

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APPLICATIONS: Forms obtainable from the Senior Representative (AV.113/6), Department of Supply, Australia House, Strand, London, W.C.2, with whom completed applications should be lodged by July 17, 1961.

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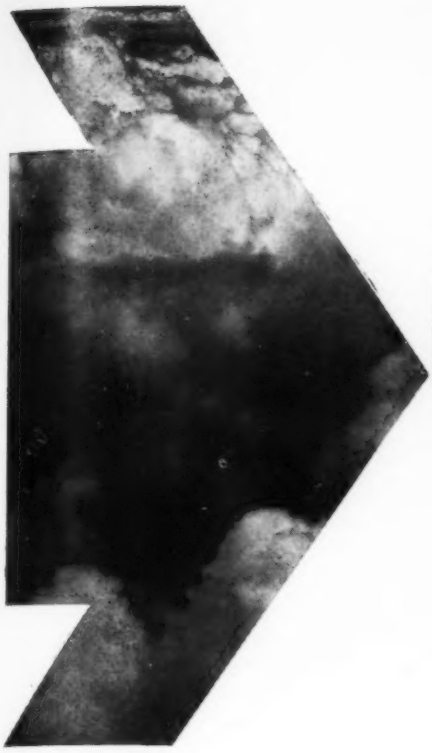

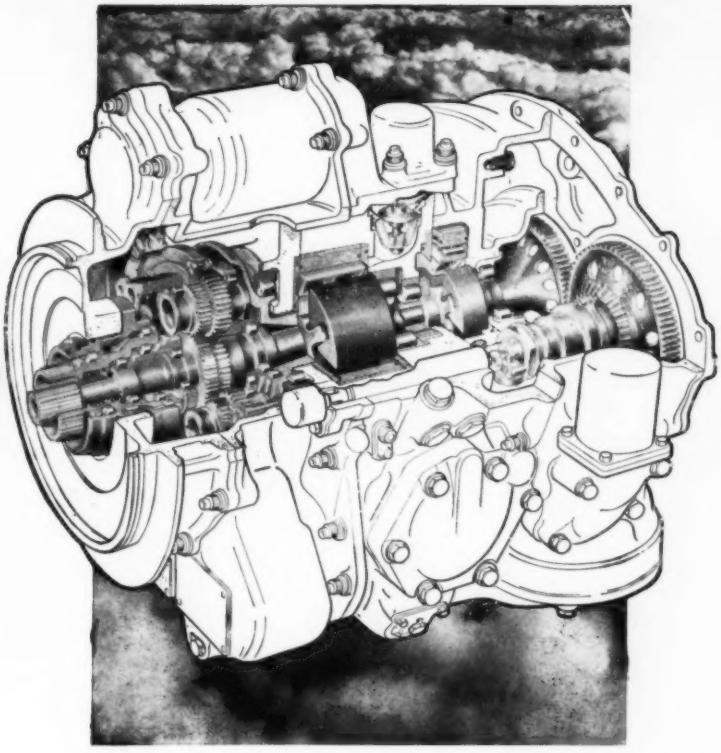

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